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Features in Manufacture of Mack Motors

Bonus System Effective in Boosting Production Without Sacrificing Accuracy—New Fixtures and Diamond Tools Show Desirable Results

BY L. S. LOVE

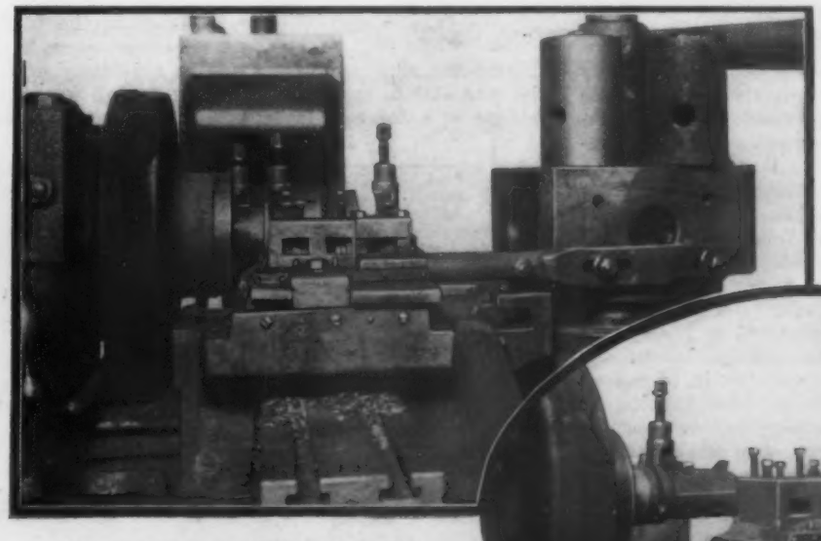
CHECKING accuracy in a commercial product to one-tenth of a thousandth and at the same time maintaining a production schedule is noteworthy even in the automotive industry. This result of combining accurate work with an incentive toward high production has been developed at the Plainfield, N. J., plant of the International Motor Co., manufacturer of Mack trucks. At this plant are built all the motors produced by the company for assembly into completed chassis at another plant. Three sizes are made, and flexibility in equipment is thus required. All motors are of four cylinders, with the cylinders cast in pairs, and they are of 4 in., 4¼ in. and 5 in. diameter, respectively.

The time study system has been worked out and provides a bonus for increased activity on the part of the operator and thus for effort to hasten setting up operations or reduced time between cuts. As a new job comes into the shop, it goes first to the engineering department, where it is analyzed and the operations planned with their sequence progressively routed. The operations are then prescribed on cards, different colors being used, cards of one color show routing, those of another color show also the time allowed for each operation. A route and time card follows each job through the shop.

In figuring the time element for a given job, a high grade operator is timed in producing not less than ten pieces at best feed and speed and from this performance the average time is arrived at. All time studies are figured in the decimal system and set in hundredths of an hour. To the actual time is added 30 per cent to arrive at the allowed time for which the operator is to be paid.

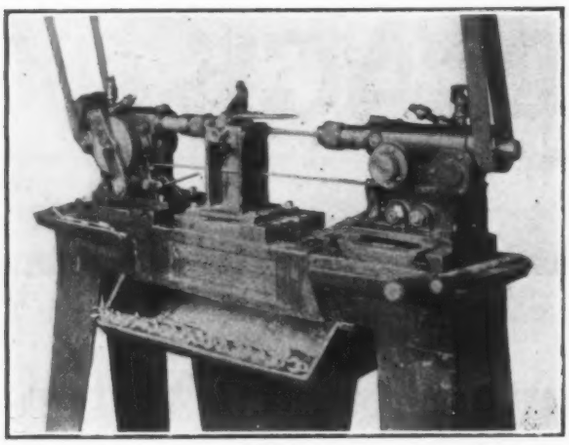
Once the time study is made and allowed time is set, there is no change nor cut made in less than a year. Then a change may be made, but only due to a change in design or method of handling. Any saving of time in setting up work or doing better than the allowed time in any other manner gains a bonus for the operator. At the same time, he must maintain the accuracy limits for the job on which he is working or have work rejected and charged against him.

A daily production sheet is tabulated, giving each



The Use of Three Tools at Once Permits Rough Turning of Pistons in a Carriage Travel of Two Inches Preparatory to Heat Treatment. Carriage feed is by push bar on turret and spring return (Left)

One Operation on Pistons Is Eliminated by Use of an Equalizing Arbor Which Chucks on the Inside of the Rough Casting, Thereby Requiring no Preliminary Boring Operation (Right)



Valve Lifter Roller Pin Holes Are Drilled and Reamed in a Semi-Automatic Horizontal Two-Spindle Drill in One Chucking, Taking Only Half the Time Formerly Needed in a Four-Spindle Machine, Which Required Another Chucking

operator's percentage of efficiency. This sheet shows whether he is a consistent bonus earner or whether he persistently falls below the production set in the time study. From this daily sheet a monthly efficiency record is compiled and each operator's percentage is noted on his record sheet in the employment department. Here his value to the company may be carefully checked according to his actual performance.

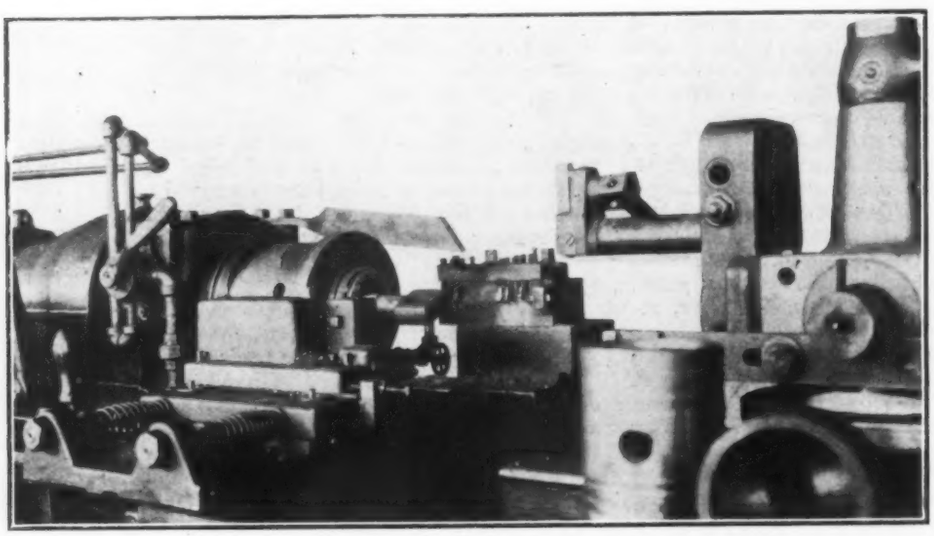
A daily cost sheet is also tabulated. This shows the acutal cost of producing each job, as it includes the operator's wages for the actual time consumed plus his bonus earned on the job. In this way a record is maintained of average costs over a period of months.

In the screw machine department an operator is allowed four machines. He is expected to keep three machines running constantly, thus being allowed one machine idle for set up. The incentive is to hasten set ups and thus keep the fourth machine running as much of the time as possible, thereby earning a bonus. Overtime beyond the regular 9-hr. day is credited at time and a half in addition to the bonus.

Piston castings, in common with various other cast iron parts, such as cylinders, valve guides, etc., are subjected to a heat treatment after the first machining operation. The machining operation removes the scale and the heat treatment, which is a baking at low temperature for 24 hr. followed by slow cooling, releases strains. One chucking has been eliminated in the revised plan of operations on pistons. It had been the custom in the past to bore the piston skirt adapter bearing in a common vertical drill press preparatory to mounting on a draw arbor with a draw pin which registered the bored skirt in a pilot for rough turning. This operation has been eliminated in the preliminary machining before heat treatment, saving one chucking.

Pistons are now mounted on an air operated equalizing arbor, which grips on the inside rough wall, properly centering the casting for turning. The operation is performed in a semi-automatic turret lathe. The cross slide carries three nickel alloy cutting tools, cutting at once, and travels only 2 in. to perform the rough turning operation over the entire surface. Feed to the carriage is effected by a push bar attached to one side of the turret; a spring returns it. When the cut is completed, the machine returns to starting position and stops, waiting for the attendant to remove the work and insert another casting.

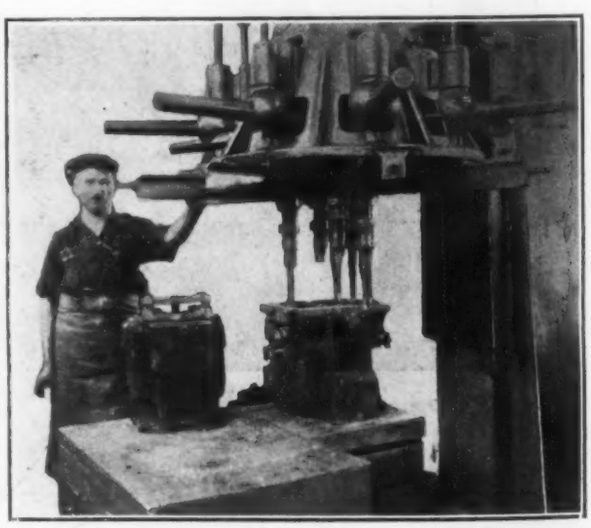
After heat treatment, pistons are bored and reamed in a semi-automatic turret lathe which has a four-sided turret. On the turret are mounted four two-jaw, box-body chucks, one on each side. These chucks are provided with special slip jaws of a form properly to grip the pistons. The combination boring and reaming tool is special and is carried in the spindle of the machine. With the four chucks in use the operation is continuous, the operator unloading a finished piston and loading another while the machine is working, after which the indexing of the turret introduces another casting to the tool. Finish turning is accomplished on a pilot with a draw arbor and pin through the wrist pin holes.



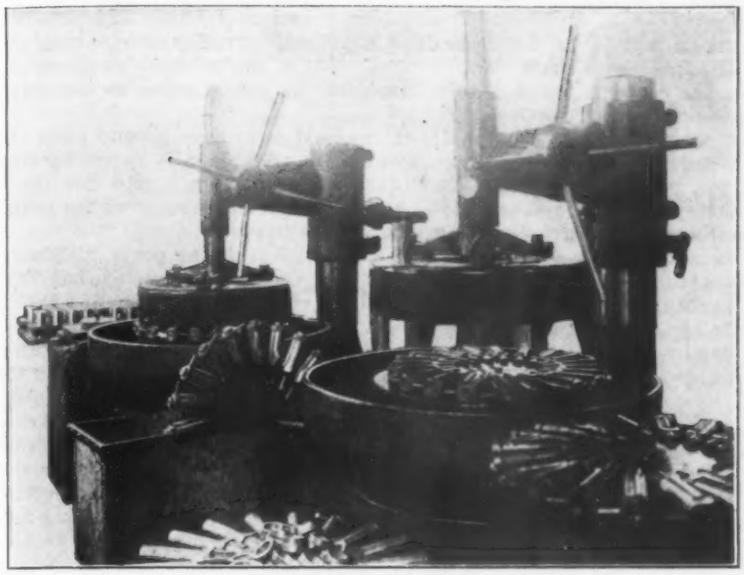
A Cam on the Lathe Spindle Serves to Reciprocate the Auxiliary Slide on the Front Carriage for Turning Piston Pin Relief on Pistons. The rear carriage turns grooves while the casting is held by a draw bolt and spring center

Wrist pin relief and ring grooves are turned in a turret lathe in which the piston is chucked as in finish turning. A spring tension center carried on the turret supports the outer end. On the fixture is a cam which actuates the cross slide against spring pressure, causing it to clear the piston periphery all over except where the pin relief is desired, at which points the cam permits the springs to push the slide into cutting position. Ring grooves are cut by tools in the rear slide at the same time.

The completing operation in the turning of pistons is one of burnishing the ring grooves to assure absolutely uniform size and also to harden them to resist ring wear. This is done in a common lathe with a hardened disk on a



Holes in Both Top and Bottom of Cylinder Castings Are Drilled Under One Cluster Head Drill, Using Two Jigs, the Drill Spindles Being Set in Two Groups. This necessitates lifting the castings from the floor only once



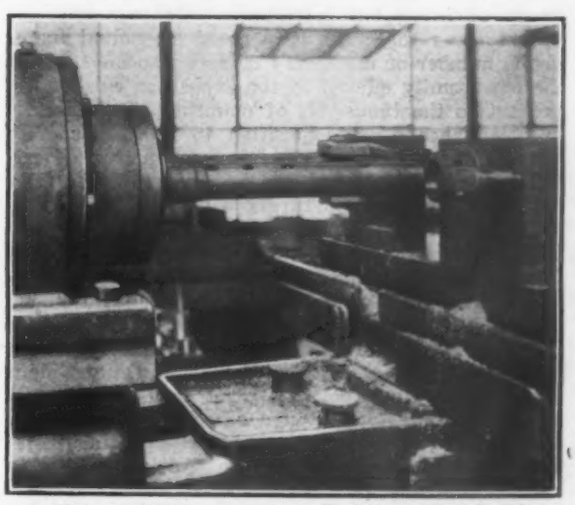
Lapping of Wrist Pins Permits Them to Be Graded in Variations of 0.0001 In. The abrasive medium is washed off in a tank of kerosene

shaft mounted in bearings on the lathe carriage. This disk has a thickness of the proper width for the grooves.

Cylinder castings, after being rough milled top and bottom and rough bored, are heat treated. The next succeeding operation is one of drilling holes in top and bottom of the castings. Those in the bottom are taper reamed and are used for location in finish boring the cylinders and also on an assembly plate when the cylinders, manifolds, carbureter, etc., are assembled before mounting on the crank case. This drilling operation is handled under a cluster head multiple drill using two jigs, one for each side of the casting. The spindles are arranged in two groups and the operator sets up first for one side, then the other, so that the machine is working constantly, with the necessity of raising the castings only once from the floor to secure the holes on both sides.

Cylinders are then finish milled four pairs at a time before being bored, reamed and burnished. The latter operation is accomplished under a radial drill with a roller burnishing tool.

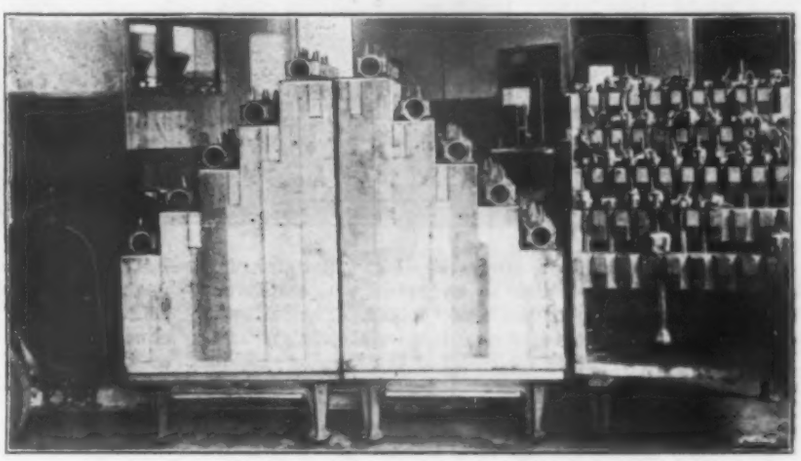
A remunerative change was recently made in the drilling and reaming of valve lifter roller pin holes.



A Converted Internal Grinder with a Special Two-Spindle Head Is Used with Diamond Tools for Boring Both Ends of Connecting Rods in One Setting

These were formerly drilled and reamed in a four-spindle, sensitive drill. The present method involves the use of a two spindle semi-automatic horizontal machine with spindles opposed. The lifters are mounted in a fixture on the machine; one spindle advances, drills the hole through both sides of the jaw or roller recess, and retires, upon which the other spindle advances from the other side and reams. The machine stops upon completion of the cycle until another piece has been inserted and the starting lever again is tripped. This change has cut the cost of this operation in half and at the same time assures alinement, as both operations are performed in one chucking.

While the International Motor Co. believes generally in the use of commercial machines for shop production, special machines or adaptations of standard machines in some cases have been found desirable. A case of this kind is in the boring of connecting rods. It has been the practice to broach the bronze wrist pin bushing in a horizontal broaching machine, for which the company makes its own broaches. This bushing was checked to limits of 0.0003 in. The split bushing, which is babbitt lined bronze, was hand reamed. These two operations are now combined in one and handled on a machine developed for the purpose. In this operation the center distance is assured and the required accuracy maintained.



Connecting Rods After Inspection Are Loaded in Special Racks Which Are Carried Two at a Time on Elevating Platform Industrial Trucks

The machine used is a converted internal grinder from which the regular work and wheel heads are removed. In place of the work head a two spindle boring head has been mounted. These spindles have fixed centers and are mounted in ball bearings, permitting high speed of operation. The boring bars carried in the heads are provided with diamond tools, which have been found when run at high speed to produce a better finish on babbitt than reamers, and maintain accuracy longer due to negligible wear. On the wheel head carriage of the grinder is mounted a fixture which carries the work to be bored.

Although the use of elevating platform industrial trucks, shop boxes, etc., is general in this plant, it was found that connecting rods were rather cumbersome to transport in quantities. For this reason racks have been provided in which they may be hung as they come off of the inspection bench. The racks when filled are transported two at a time to the assembly department, thereby greatly reducing the number of trips necessary to carry a given number of rods.

A number of improvements in the design and manufacture of wrist pins have recently been instituted. Formerly these pins were designed with a straight

bore, and were machined, ready for carbonizing, in a four-spindle automatic screw machine and a hand turret lathe on the second operation. The present wrist pin has a tapered hole, tapering from the center both ways, giving a thicker wall in the center and consequently less likely to show deflection under strain. The manner of manufacture has been changed to accommodate the taper, but the making of the pin requires no more time than did the straight hole pin. It is rough bored in a four spindle screw machine, centered and champfered in a hand turret lathe and then turned on an arbor to 0.010 in. It next goes to a centerless grinder to be ground before carbonizing, after which it is taper bored in a double end four spindle chucking machine. Next the pin goes to the centerless grinder again, where it is ground to limits of 0.0002 in.

A recent addition to the operations is one of lapping which effects even closer accuracy, namely, 0.0001 in., to which they are graded under a Prestwich fluid gage. This lapping machine is one recently placed on the market by Warren F. Fraser, Westboro, Mass. It consists essentially of a base and column, each supporting a large cast iron surfaced disk. Through the center of the lower disk is an arbor which delivers an eccentric motion to the work holder. The latter is a disk having arms to receive the wrist pins, permitting them to roll under the effect of the lapping motion. These arms are on lines which would form chords to the disk circle rather than being radial. This angle together with the eccentric motion of the arbor and the rotary motion of the pins themselves is effective in constantly changing the relative contacts between the disks and the work. Flour of emery and oil is used as the grinding medium. This is washed off after the operation is complete by immersion in a tank of kerosene which permits the solid matter to settle.

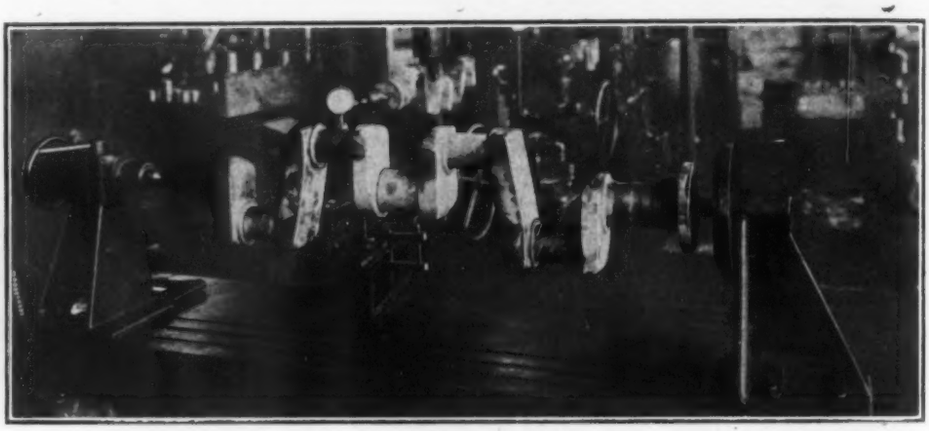
On the inspection bench these pins are graded according to a range covering 0.0007 in. in seven grades. They are then etched with a number in the bore according to size by tenths of thousandths. The grading of the seven sizes permits 0.0002 in. under size and 0.0005 in. over. These pins in turn are matched with pistons and rods which show corresponding variations in size. As an example, a wrist pin measuring 1.6244 in. would be called a No. 3 it would be assembled with a No. 3 piston and rod bushing which measure 1.6247 in. and 1.6249 in. respectively. Wrist pins when assembled are full floating, being held in place endwise by retainer springs in grooves in the piston holes.

The Mack truck is one of the comparatively few motor vehicles which has a case hardened crank shaft. After turning, the shafts are placed two in a box with a commercial compound and are brought up to 1700 or 1750 deg. F. in about 4 hr., where they are held for 24 hr. before plunging. This is found to give a hardened case ¼ in. deep. Naturally they stretch and warp somewhat under this treatment. Experiments have been made with a clamp attached before plunging, but so far this has not worked out satisfactorily. To overcome the warping, the shafts are swung in centers mounted on a surface plate. On one center are gaging disks to which the dial indicator height gage is set. Straightening is done under hydraulic straightening presses. It has been found that frequently pressure on the central main journal is sufficient to spring the shaft back to line. These shafts must gage on all bearings to within 0.060 in. before going to the crank grinders.

Cam shafts in the past have been ground from the rough. An innovation in this plant is rough turning in a cam shaft turning machine in 5 min. for the 8 cams instead of 15 min. as formerly required for rough grinding, a saving of two-thirds.

In the making of the helical timing gears, all blanks are annealed before cutting and the practice has been to test gears for concentricity of the pitch line before the gears go to heat treatment. They are meshed with master gears in a testing bench and must run within 0.003 in. It was found that to secure this accuracy it was necessary to cut only one gear on an arbor, thereby avoiding spring and chatter due to placing more gear blanks on an arbor and applying cutting pressure farther from the hobbing machine face plate.

After hardening, the bore and hub face are ground in an internal grinder. The work spindle of this machine carries a ring chuck which fits the outside diameter of the gear. Three pins are placed about the gear between teeth at equi-distant points and serve to center the gear on the pitch line and drive it as the chuck revolves. Flat wheels and cup wheels are used on the bore and hub face respectively.



After Case Hardening, Crank Shafts Are Straightened to Within 0.060 In. Under Hydraulic Straighteners Before Going to Crank Grinders

(To be concluded)

Metal Working Machinery to Be Exhibited at Steel Treaters' Convention

The metal working machinery manufacturers have come to recognize the international steel exposition, held jointly with the convention and under the auspices of the American Society for Steel Treating, as an excellent opportunity to exhibit their product to a large group of interested individuals. Consequently, from year to year there has been noted a gradual increase in the number of machinery dealers who have accepted the opportunity offered by the exposition to show their product to the thousands of manufacturing executives in attendance. The exposition to be held at Motor Square Garden will have a larger number of metal working manufacturers than ever before. The following machinery manufacturers will have their exhibits in operation: National Automatic Tool Co., Richmond, Ind.; Baker Bros., Toledo, Ohio; American Tool Works Co., Cincinnati; Gould & Eberhardt, Newark, N. J.; Cincinnati Milling Machine Co., Cincinnati; V. & O. Press Co., Hudson, N. Y.; Warner & Swasey Co., Cleveland; Keller Mechanical Engineering Corporation, Brooklyn; National Machine Co., Tiffin, Ohio; Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.; Ohio Machine Tool Co., Kenton, Ohio; Laughlin & Barney Machine Co., Pittsburgh; Avey Drilling Machine Co., Cincinnati; Oliver Instrument Co., Adrian, Mich.; Millholland Machine Co., Indianapolis; Universal Grinding Machine Co., Fitchburg, Mass.; Blanchard Machine Co., Cambridge, Mass., and High Speed Hammer Co., Inc., Rochester, N. Y.

New Testing Methods for Castings—I*

Transverse and Shearing Tests Recommended and Tension and Shock Tests Condemned—Argument for Testing a Part of the Casting Itself

IN response to the invitation of the Institution of British Foundrymen to present a paper at the Congress at Birmingham, the French Foundrymen's Association has chosen as a subject of world-wide interest the new methods established by the researches of two French scientists for inspecting the strength of castings. Both men are well known in England. One of them, Mr. Fremont, was awarded the Bessemer medal at the last gathering of the Iron and Steel Institute, in Paris last September. The other, A. Portevin, has presented to the same institute a large number of reports and has received from it the Carnegie medal.

Great progress in foundry practice can be hoped for by the systematic employment of these methods for testing. They deserve to be taken into consideration

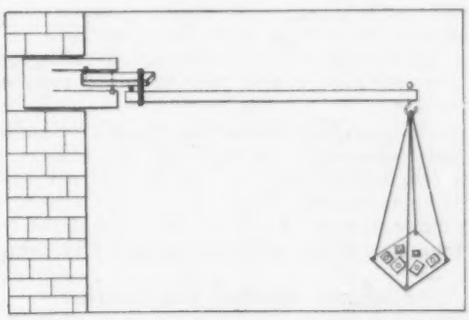


Fig. 1. Sketch of the Ramus Machine, often Called the Monge Machine—One of the Earliest Known Devices for Testing Materials

and carefully tried out. Since the start of the industry the transverse test has been employed. In 1790 we find the Ramus machine, now known as the Monge machine, described in the annals of chemistry. (See Fremont: "New Methods of Mechanical Tests on Castings" [in French], page 11.) The great scientist Monge, who described and employed this machine, was considered its inventor. The researches of Mr. Fremont show that the actual inventor is Michael Ramus, manager of the Creusot foundry. The test bars were square and measured 80 mm. (3⅛ in.) on the side and about 50 cm. (20 in.) in length. They were gripped at one end and loaded at the other end.

Fig. 1, copied from Mr. Fremont's paper, shows the Ramus machine, which has been described and illustrated by Monge in the "Description of the Art of Manufacturing Cannons" (Paris, 1794, page 18). This fact is the cause of the machine having been attributed to Monge, although he refers to it as the "Creusot machine." Although Mr. Fremont and many others consider the transverse test as the ideal one—Monge's test is still described in the majority of French specifications—this test has been practically abandoned and replaced by two worthless tests, the tension and the shock test.

Colonel Prache, in his paper before the Congress of the Belgian and French Foundrymen's Associations held in Liége in 1921, says: "The progress of semi-steel during the war was retarded by the mechanical tests imposed by the artillery department. Whoever has made any semi-steel shells knows that these tests had only a remote connection with the castings which were run."

Practice in Various Countries

In America, transverse tests were taken in the past on square or rectangular test bars of all dimensions and all lengths. Great efforts have recently been made in that country to agree on a standard test bar and prevail on other countries also to accept it. A round test bar of 1¼ in. diameter was chosen, to be broken on knife edges with a spread of 12 in.

However, the American pipe foundries are using a bar of 2 in. by 1 in. placed flat on knife edges spread 24 in. apart. Wheel manufacturers who use a tempered casting process employ the same bar, while other factories retain the old bar, which is 1 in. square and rests on knives with a spread of 12 in. Finally, test bars have been broken on knives with a 3 ft. and even a 5 ft. spread. Keep has experimented on and recommended test bars ½ in. square, resting on knives with 12-in. spread.

In England the standard test bar is 2 in. high, 1 in. wide and 3 ft. 6 in. long, and rests on knives with a 3 ft. spread. In Germany the transverse test is employed on round bars of 30 mm. (1.2 in.) diameter by 650 mm. (25⅝ in.) length, poured from the top in oven-dried molds, and broken on supports with 600 mm. (23⅝ in.) spread. In France the Monge test has been practically replaced by the tension and shock test.

The shock test is made on a 40 mm. (1.6 in.) square bar, 200 mm. (7⅞ in.) in length, resting on knife edges with 160 mm. (6.3 in.) spread; a weight of 12 kg. (26½ lb.) dropping from an increasing height produces the break. The starting height and the increase between successive drops vary according to the specifications. The tension test is made on test bars of either 16 mm. (⅝ in.) diameter, or of 25 mm. (1 in.).

The Case Against Shock and Tension Tests

To prove the shock test worthless, Mr. Fremont compared the results obtained on bars tested with the drop

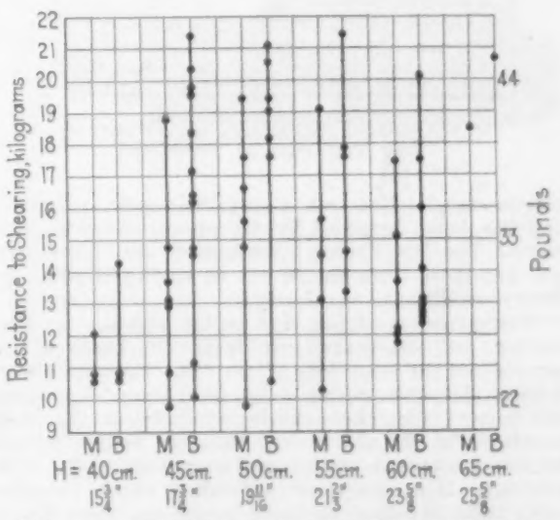


Fig. 2. Comparison of Shearing Tests with Tests Made with the Drop Hammer

hammer with those on shearing tests made on fragments of the same test bars. The results are shown in Fig. 2.

These shearing tests were made on small test bars of 2 x 10 mm. (0.08 x 0.39 in.), some of them selected from the center and the others from the edge of the thick shock bars, with a square section 40 x 40 mm. (1.6 x 1.6 in.). For each bar broken under shock at a given height, shearing tests were made on bars selected at the center and at the edge. The points relate to the shearing tests, *M* signifies center (*middle*) and *B*, edge (*border*) of the test bar. It will be seen that some

*Paper presented by E. Ronceray, to the Institute of British Foundrymen in the name of the Technical Foundrymen's Association. Translated by E. J. Lowry, Hickman, Williams & Co., Pittsburgh.

of the test bars taken from the large bars, having broken at a small height, gave excellent results, while the opposite result is found sometimes on tests from the bars which broke only at a great height. The resistance of the test bars from the center is always less than that of those taken at the edge. This is to be explained by the difference in cooling speed. These results are sufficient to condemn the shock test itself, even if there were no other reasons.

Everybody knows that the tension test has no value for castings, owing to their sensitiveness against lateral strain. In fact, Mr. Portevin has demonstrated by the mirror method that the tension test is without any value when taken under ordinary conditions. The same remark applies to tempered steel, which presents the same characteristics.

In America the tension tests are accepted, but not

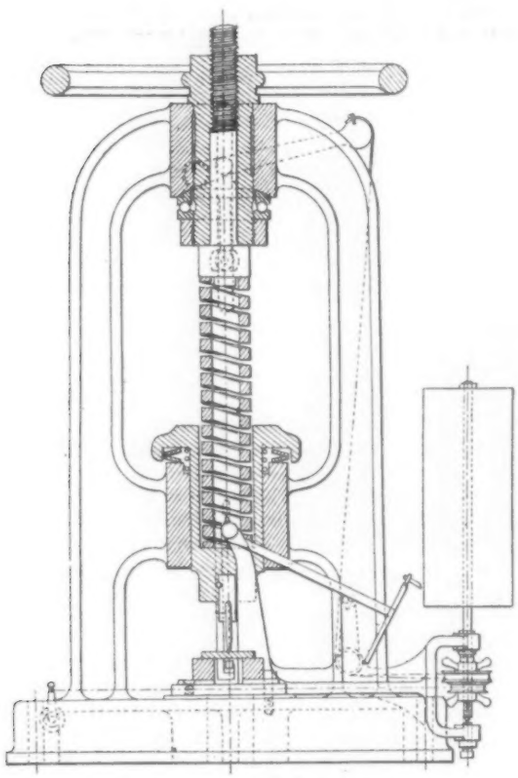


Fig. 3. Machine Designed by Mr. Fremont for Using Test Bars of Small Size

recommended. This test is very little used in England and has been discarded by the specifications in Germany. The best French investigators are of the opinion that these tests should not be employed under ordinary conditions.

The structure of cast iron varies with the speed of cooling, and consequently with the thickness of the sample and the conditions of the run. It seems almost unbelievable, even during the present times of progress and science, that the qualities of cast iron should be examined by the aid of test bars run separately and whose structure is entirely different from that of the castings. It is surely very difficult to obtain from the same ladle any two specimens giving the same results on tests. What can be expected of test bars run separately from the castings whose quality they are to control, and of a thickness entirely different from these castings, and generally cast at a different time?

Colonel Prache was quite right in saying that "the service tests of the artillery department have hindered the foundrymen in making better shells," and so was Mr. Portevin when he said that "from the point of view of the quality of the metal for shells it is difficult to make a worse selection of testing methods." It is easy to understand that, to obtain results which can be compared for shells of different thicknesses, test bars of different thicknesses should have been chosen. But the best way would surely have been to judge the quality of the castings by test bars taken from their own mass, rather than on test bars more or less different from the castings themselves. The objection to this method is the impossibility to sacrifice a casting from a given lot in order to secure a test bar.

The investigations of Mr. Fremont and Mr. Portevin relate to such methods, and in our opinion are capable of giving considerable progress to foundry work. Their methods will permit foundrymen to choose the best

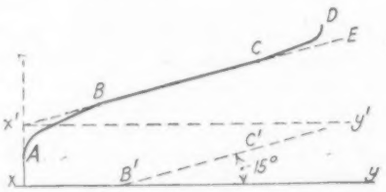


Fig. 4. General Character of Diagram from the Fremont Machine, the Elastic Limit Being Reached at *C*, and the Angle Measuring the Coefficient of Elasticity

compositions of metal and the best foundry methods. Mechanical engineers will then have an opportunity to modify their designs and benefit to the fullest extent from the results given by all the many tests which will be made on different castings. The result will probably be that the confidence in a given casting will grow, because the finished product will be more regular and more reliable.

It would be a great advantage if such methods were submitted to a commission made up of members of the various foundry associations, for the purpose not only of choosing tests to be recommended, but also to agree on the dimensions of the test bars, so that the results of all foundries or all investigators could be compared.

Fremont's Bending Test Machine

To study in the laboratory the qualities of a casting, Mr. Fremont recommends the static bending test. But as this must be made on test bars taken from the castings themselves, he has constructed a machine which will permit the employment of a test bar of reduced dimensions. He also thought it necessary to tell the conditions of the test. He chose the dimension of 10 mm. (0.39 in.) width by 8 mm. (0.31 in.) thickness and 35 mm. (1.4 in.) length, so that the test bar can be cut from the casting at any desired spot, thus enabling the investigation of all the various parts. His machine, which is provided with a recording apparatus, is shown in Fig. 3.

To verify the practical values of the results ob-

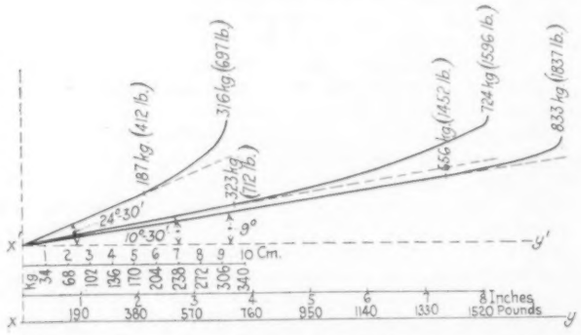


Fig. 5. Three Typical Diagrams Obtained on the Fremont Machine, Illustrating Different Qualities of Castings and Superposed to Permit Comparison

tained by this method, he has made tests on 110 specimens of castings, for most of which he was cognizant of their results through practical tests.

The dimensions of the test bar chosen were determined by the power of the machine, which is from 1000 to 1500 kilos (2205 to 3307 lb.), but the effort must be brought about gradually, without the least attempt at extreme shock in breaking. The method chosen is the one using a hand wheel drive on a screw, with the insertion of a large spring between screw and the punch

holder. This spring acts gradually and, without shock, transmits the strain of the screw.

The weight of the movable part is balanced by a resistance coil spring placed in the slide of the frame. The large spring will bend proportionately to the work applied, which it transmits at the rate of 1 mm. for 43 kgs. of pressure (1 in for 2408 lb.) The breaking of the test bars takes place only when the screw has made from 3 to 8 revolutions, according to the strength of the casting. This permits a simple and easy way of measuring the strain applied. The elastic limit or coefficient of elasticity is obtained by reading a recording diagram.

A suitable device carries the drum along, by means of wire in connection with a large spring, so that 1 mm. on the line of the abscissae corresponds to a strain of 3.4 kg. (190 lb. for 1 in.) As the bending of the test bar is very minute, it is enlarged about 200 times and recorded on the line of ordinates.

Fig. 4 shows the diagram obtained. The left side shows a curve which results from the contact of the test bar with the recording knife. The actual starting point is x', $x'y'$ being considered as the zero point. When this line is no longer straight, at C, the elastic limit is reached, and the angle E, $x'y'$ gives the measure of the coefficient of elasticity.

Breaking of the test bar, owing to the nature of the

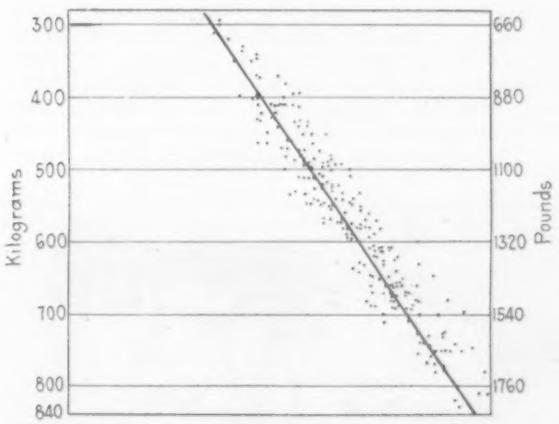


Fig. 6. Showing Proportionality Between the Resistance of a Casting to Bending and Its Resistance to Shearing

casting, is always sharp. To eliminate damage to the recording apparatus, two Belleville washers have been placed under the tool carrier. The run of the punch is thus limited to 2 mm. (0.08 in.) However, a special device is provided to prevent the horizontal levers from being injured when the test bar breaks.

The machine is weighted, in measuring the bend of the large spring under a given load, or else while acting on a scale which is gradually weighted. A like proceeding is used to get the deflection of the test bar, by pushing the levers through the intermediary of a precision caliper.

Fig. 5 shows three typical diagrams, corresponding to the different qualities of castings and arranged to permit comparison.

For the first breaking load, 316 kilos, (697 lb.) angle 24 deg. 30 min.
For the second breaking load 724 kilos, (1596 lb.) angle 10 deg. 30 min.
For the third breaking load 833 kilos, (1837 lb.) angle 9 deg.

This diagram shows that the deflection has varied from the low to treble this figure. The coefficient of elasticity can be determined by the bending diagram. Numerous experiments made by Mr. Fremont show that, the more resistant the casting is, the smaller the bending will be, while the variation for steel is infinitely small. He recommends this method for examining metal and establishing the terms of specifications for the laboratory. For the acceptance of the finished castings he recommends the shearing test.

Shearing Tests have been investigated for daily acceptance of castings. In a preceding article on steel

* "Principles of Iron Founding," Moldenke, page 163.

Mr. Fremont demonstrated that the phenomenon of shearing or punching is an action of tension and not of sliding, as had been supposed. The various layers compressed by the punch or the shear blade will not separate at once from the layer from which they come.

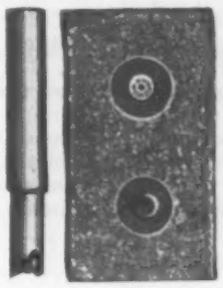


Fig. 7. Hollow Drill of Milling Form and the Holes It Cuts. The core is broken out and forms the test piece

Every fiber of metal will act as a tension test bar, which will elongate under the strain of the tool. (See Paper on Riveting, in French, "Bulletin of the Society for the Encouragement of National Industries," 1906).

He has been able to demonstrate that for steel there is a direct relation between the resistance to shearing and the resistance to tension. To determine this matter as far as the casting is concerned, he made tests on 110 specimens from castings, of which he knew the results of their static bending tests. He has been able to ascertain that the resistance to shearing for the casting is proportionate to the resistance to bending, as is demonstrated in Fig. 6. This has been confirmed by new experiments of Mr. Portevin, in semi-steel.

Other experiments have shown that, for castings, the resistance to tension is equal to the resistance to shearing. Consequently a shearing test is perfectly satisfactory for the acceptance of the castings and, moreover, there is no chance for any errors similar to those of the present tension test. To pass on the quality of a casting, it occurred to Mr. Fremont to test a small square prism of 5 mm. x 5 mm. (0.2 in. x 0.2 in.) taken from the piece, or a small cylinder of 5.64 mm. (0.22 in.) diameter; that is, in each case to use a section of 25 sq. mm. (0.04 sq. in.) from the casting.

This method was presented by him to the International Congress for Testing Methods, held in New

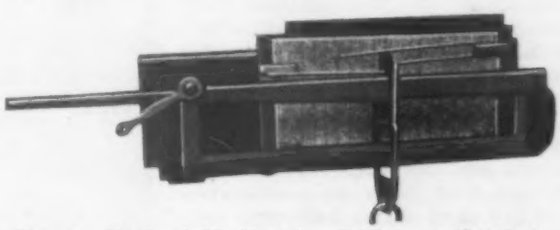


Fig. 8. Head of Machine for Cutting or Shearing Test Pieces and Autographically Recording the Effort Required to Overcome the Resistance

York in 1912. Dr. Moldenke said:* "These small stems are sheared every 3 mm. (⅛ in.) and the average is taken. The proportion is exquisite in its novelty and ingenuity."

It is often possible to take from finished castings small prisms of metal which can be adjusted to the square section of 5 mm. x 5 mm. But when this is impossible, the same results are obtained by drilling holes in the casting in a special way, which leaves a bar of metal in the center to serve for the test piece. The hole made by this operation may be plugged if necessary. These holes are made with a drill in the shape of a round mill, having a diameter of 10.5 mm. (0.4 in.) Fig. 7.

This round mill in cutting leaves in the center of the hole a small cast iron cylinder, 5.64 mm. in diameter (25 sq. mm. section), constituting the test bar. This test bar is detached with a special small tool made up of two eccentric tubes which enter the drilled hole, leaving a small clearance within each other. The inside of the small tube has a diameter of 5.64 mm., while the outside of the larger one has a 10.5 mm. diameter. The two tubes are pushed into the circular

slot hollowed out by the round mill. By turning the outer tube with the aid of the lever, the inner tube is kept immovable and the test bar is thus separated.

This test bar, round or square, is then cut 3 mm. x 3 mm. (⅛ x ⅛ in.) and at the same time the strain is measured. This gives the resistance of the casting at the periphery and at the different depths of the casting chosen. One of these castings, of about 20 mm. (0.79 in.) length and weighing about 4 grams, (1/7 oz.) permits making five shearing tests, i.e., less than 1 gram per test instead of more than 1 kg. (2.2 lb.)

The cutting is effected between two blades with parallel cutting surfaces. The machine employed for this method, as shown in Fig. 8, is to be slightly modified, to make its use more convenient in practice. It consists simply of a lever which has a stationary point, with a device for applying on the blade the strain of a movable weight running along the lever. This weight is shifted by a small handle that is drawn on the weight by a spring, but a device with screw and fly-wheel will be provided on future machines.

The strain is multiplied in proportion to the arms of the levers. When the effort corresponds to the strength of the test bar, the breakage takes place. During the operation a pencil shifts along a slip of paper, producing a diagram similar to the one shown. The table, arranged according to the constants of the machine, gives the strength of the specimen tested.

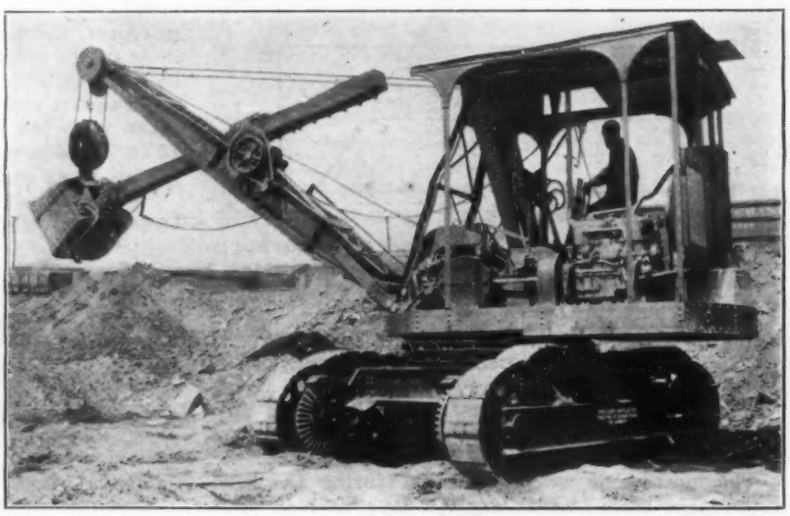
(*To be continued*)

New Gasoline Dipper Shovel

A gasoline driven power shovel operated entirely with gears and shafts is being marketed by the Orton & Steinbrenner Co., 608 South Dearborn Street, Chicago.

In adapting the gasoline motor to a dipper shovel, the principal difficulty has been in the necessity to provide an arrangement to take the place of the independent source of power for the reversible crowding motion of the dipper stick. With the steam-operated type this is accomplished by means of a small steam engine geared directly to the dipper shaft. With the gasoline or electric type this method is said not to be feasible. Of sprocket and chain arrangements and wire rope drives, the company claims that they will not stand up under severe usage, especially where the cables are bent over a number of small diameter sheaves and drums, and reversing curves are employed.

Positive gear drive is an outstanding feature of the machine illustrated. A shaft at the bottom of the boom connection carries double steel bevel gears and bronze friction clutches. This shaft is concentric with the pivot of the boom and consequently, being independent of its position, the boom can be used at any angle to suit the exigencies of the work. A steel shaft carrying two bevel pinions extends along the boom. One pinion meshes at the bottom with the gears on the horizontal shaft, and the other at the top meshes with gears on a countershaft located about half way up the boom. The countershaft carries a brake and "slip friction," and is geared directly to a cast-steel rack on the dipper stick. With this arrangement it is claimed that a minimum number of levers are required and fatigue incident to operating the rope-driven type is eliminated.



Gasoline Driven Dipper Shovel Operated Entirely by Gears and Shafts. Shovel boom may be taken off and crane boom substituted. With double drums, the shovel may be used interchangeably with the crane

The hoisting mechanism is the same as used in the company's locomotive cranes. The machine may be conveniently converted into a clam-shell outfit, drag line or skimmer rig. Power is supplied by a heavy-duty four-cylinder Climax motor, and the drive is by means of steel shafting and bevel gears. The flexible crawling tread is a feature, and steering is accomplished by one man in the cab. On the main horizontal drive shaft are two brake wheels by means of which each tread may be operated independently or both may act together. The mechanical differential arrangement is similiar to that used on automobiles. Alemite fittings are used exclusively in lubrication.

In using as a crane, only the shovel boom need be removed and the crane boom attached. The crowding frictions for operating the dipper being carried by the shovel boom and an integral part of it are removed with it. The shovel when equipped with double drums may be used interchangeably with the crane. With the crane boom attached various types of buckets or scoops may be used and pile driver leads may be swung from the tip of the boom.

To Take Over Plant of Eastern Ohio Mfg. Co.

C. G. Thomas, Warren, Ohio, announces that a new company will shortly be formed to take over the plant of the Eastern Ohio Mfg. Co., Warren, Ohio, which will be equipped for the manufacture of cold-rolled strip steel. The plant will have an initial capacity of 1500 tons per month and will specialize in the manufacture of the highest grade of strip steel, including various high carbon, alloys, nickel plating steels, etc.

The organization will include C. H. Lewis, formerly secretary of the Western Reserve Steel Co. and later with the Niles Trust Co., Niles, Ohio.

E. B. Hite, Lancaster, Pa., will also be associated with the company as general manager in charge of operations. Mr. Hite has had a wide experience in the manufacture of strip steel. He was formerly with the Crucible Steel Co. of America and for the last few years superintendent of the Lancaster Steel Products Co., which is a subsidiary of the General Motors Corporation and produces strip steel for its various plants.

It is expected that the plant will be in operation prior to Jan. 1, 1924.

Jones & Laughlin Steel Corporation, Pittsburgh, has adopted a plan for the sale to its employees, under special terms, of its cumulative preferred 7 per cent stock at $107.50 a share. A maximum of 5000 shares will be sold on this, the initial offering. Details of the plan have not been made public.

The Rôle of Chemistry in Semi-Steel

Chemical Control of Both Raw Materials and Finished Product Necessary—Rôle of Combined Carbon—Effect of the Other Elements

BY J. E. BOCK*

AS gray iron foundrymen we all aim to produce castings which are strong and tough and at the same time are easily machinable. There is no process by which gray iron can be given these desirable properties more readily, at a reasonable cost, than by the addition of steel scrap to the mixtures in the cupola. The product thus obtained is popularly known as semi-steel. Some people, especially in the last year or two, have objected to this name as being misleading, and for other more or less valid reasons. It is not my intention either to defend or to find fault with the name. I merely use it for want of a better one, and because it means to me, as I am sure it means to most of you, a gray iron of exceptionally high quality, made from mixtures containing from 10 to 40 per cent of steel, and having a tensile strength of at least 30,000 lb. per sq. in. and transverse strength of at least 3200 lb. These values are for mixtures containing the minimum steel additions and are correspondingly higher as the percentage used approaches 40 per cent.

Continuous Chemical Control

Such a product is uniformly obtainable only when both raw materials and the finished castings are under continuous chemical control. Any foundry whose work is of such nature as to require particularly close-grained, tough iron will find it a paying proposition to employ the services of a chemist. I mean a chemist who is on the ground, in constant touch with the foundry and its personnel, rather than one or more outside chemists who supply analyses now and again with more or less accuracy and do not take a personal interest in the work at hand. In the foundry of the Vilter Mfg. Co., Milwaukee, we are concerned primarily with ammonia fittings, which are subjected to pressures up to 300 lb. per sq. in. in service, and consequently close-grained iron is absolutely essential to success. In this paper it is my purpose to tell you as briefly as may be the more important aspects of my work.

While one naturally thinks of chemistry as applied to semi-steel as a laboratory process, the foundry chemist who does not spend considerable time in the foundry itself cannot hope to be successful. In our case, it is about a fifty-fifty proposition, and I know that, however important the chemical tests are, the work within the foundry is no less essential. The chemist should personally check over the blue prints of all castings to be made so that he can acquaint himself with their intricacies. This is especially important in a jobbing shop. He can then intelligently calculate mixtures for the different classes to be cast. The weighing off of these mixtures should be done under his personal supervision or that of a competent assistant. The charging of the cupola should be similarly handled. When the iron begins to flow he must again be on the job to check each tap as it is made and to see to it that the metal gets to the mold or molds for which it is intended quickly, and in proper condition for pouring.

Cupola Practice

In this connection one cannot too greatly emphasize the importance of good cupola practice, and consequent hot, fluid metal. If semi-steel is not melted hot, the reaction gases cannot escape and the component parts of the mixture cannot mix properly. The resulting castings will be dirty, spongy and altogether unsatisfactory. A number of good textbooks are available in which good cupola practice is described in detail. There are also illuminating articles appearing from time to time in the technical press, so that one would no longer expect to find poorly operated cupolas. However, we hear of many instances to the contrary and if you are obtaining anything but the best results, a little investigation will repay you beyond the shadow of a doubt. The reactions which take place within the cupola form as important a part of the chemistry of semi-steel as the laboratory work itself, and this paper would be most incomplete without at least a brief summary of the outstanding essentials of good cupola practice.

The ratio of the tuyere area to the area of the cupola is very important. The height of the charging door often is a deciding factor. The proper amount of coke on the bed is of utmost importance, and it is a good idea to light the bed sufficiently early so that it may be thoroughly burned through before charging is begun. As regards the amount of coke between charges a ratio of approximately 10 to 1 will be found correct. A mild blast of sufficient volume is always to be preferred to high blast with its attendant evils. Use as little daubing as possible and avoid excess sand on the cupola bottom.

Analyses Which Are Necessary

Let us now consider the work in the laboratory from the practical viewpoint rather than the theoretical. As already brought out the chemist controls semi-steel (or ordinary gray iron for that matter) by analyzing both raw materials and finished product. The physical state of the raw materials frequently has as much influence upon the results obtained as has the chemical analysis. Pig iron constitutes upward of 50 per cent of the ordinary semi-steel mixture.

The machine cast product is, to my mind, much to be preferred not only because it is cleaner, but because it is of more uniform size. The laboratory analyzes all pig iron received for silicon, sulphur, phosphorus and manganese. Carbon determinations are rarely made in this connection. Graphite and combined carbon in the raw material have no direct relation to the corresponding constituents of the finished castings and are therefore of no value. Total carbon is sometimes determined for use in deciding upon the percentage of steel to be added to a given mixture.

The most important factor, however, in deciding upon the percentage of steel to be used in making the mixture is the thickness of the metal in the finished castings. The lightest sections ordinarily require 10 to 20 per cent of steel and the percentage is increased with increase in section, 40 per cent being the highest percentage feasible under ordinary melting conditions. As regards the kind of steel scrap which is suitable, in general any mild, low carbon steel of suitable size will fill the bill. By suitable size we mean pieces weighing approximately the same as the ordinary pig iron and of roughly the same dimensions. Large pieces will not melt so rapidly as the balance of the charge, and abnormally small pieces will be badly oxidized even before reaching the melting zone. Either condition will result in poor quality metal decidedly off analysis. The laboratory analyzes all steel scrap received for carbon, sulphur, phosphorus and manganese, which are relatively important in the order given.

The remaining raw material, which is usually used to make up the balance of the semi-steel charge, is scrap gray iron. Many foundries use any scrap which may be available and do not hesitate to use as much as

*The author is with the Vilter Mfg. Co., Milwaukee, Wis. The paper was presented before Wisconsin Foundrymen's Association, Madison.

50 per cent. It is our practice, adhering closely to analysis, not only to limit the gray iron scrap used to 25 per cent, but to use only our own semi-steel scrap as produced from day to day. The analysis of this material is checked continuously in checking the finished castings and it is the only safe scrap to use.

Use of Ferroalloys

Occasionally we make use of alloys to supply deficiencies in the pig iron available, but we aim to avoid their use whenever possible. If charged into the cupola we have found invariably that there are large losses and, furthermore, that the product obtained is not uniform in spite of every precaution. If added to the metal in the ladle the alloy is rarely properly fused, and in any case it chills the metal by the amount of heat required to melt the alloy added. Ferrosilicon and ferromanganese are the two alloys commonly used and the laboratory checks these for silicon and manganese content respectively when we cannot avoid using them.

Quality of the Coke

In addition to the raw materials mentioned the laboratory checks numerous other products which are used in semi-steel practice. Among these are fireclay, firebrick, various sands, limestone and coke. Because of its far-reaching effect upon the finished product, both as regards temperature and chemical composition, the coke must be checked most carefully. Equally important, if indeed not more important than chemical composition, is the cell structure of the coke. The best coke for cupola use must be dense and hard. Such a product will not burn too readily in the upper part of the cupola and can be depended upon to carry the heavy burden without crushing.

A given shipment of coke should contain a minimum of so-called "black butts" or ends. The chemical determinations usually called for are moisture, fixed carbon, ash, volatile matter and sulphur. The fixed carbon is the sum of the ash and volatile matter subtracted from 100 per cent, and inasmuch as the volatile matter is fairly uniform and relatively small in amount it is the ash primarily which gives an indication of the thermal capacity of the coke. Good coke carries less than 12 per cent ash, and the less the better. The sulphur in the coke must, however, be watched with equal care because it determines so largely the amount of sulphur in the finished castings. With good cupola practice and coke running 0.85 per cent or less in sulphur the amount of sulphur absorbed by the metal will be about 0.02 per cent; but no matter how good the cupola practice, if the coke runs 1.00 per cent or over in sulphur, 0.06 per cent or often more will be absorbed and high quality semi-steel becomes an impossibility, unless extraordinary measures, such as an all-pig and steel scrap mixture, are resorted to.

Proper Amount of Combined Carbon

In the case of the finished castings the important determinations are silicon, sulphur, phosphorus, manganese and total carbon as in the case of pig iron, but to these is added the estimation of the combined carbon content, and in this case the latter is the most important of all. It is the amount of combined carbon which determines the hardness, and incidentally the machinability of the finished semi-steel. A combined carbon of 0.75 per cent to 0.80 per cent is ideal, for it means a close-grained iron, still readily machinable. As the combined carbon is increased to 1 per cent the castings become very hard, and above 1 per cent the best tool steel cannot make an impression upon them.

The rate of cooling (disregarding chemical composition for a moment) is the deciding factor which determines the amount of combined carbon which will be formed in a given casting. When, however, we vary the chemical composition of the mixture we can obtain as little or as much combined carbon as we desire. It is for this reason that chemical analysis is so indispensable where uniform results are an object. Silicon, sulphur, manganese and phosphorus influence the amount of combined carbon formed, in the order named.

The silicon content is the generally accepted basis upon which all pig irons are classified and sold, for the very reason that its influence upon the condition of the carbon is the greatest of all. High silicon increases the amount of graphite formed and, since the amount of graphite plus the combined carbon equals the total carbon, it necessarily decreases the combined carbon formed. In light castings high silicon is desirable because it tends to counteract the rapid cooling effect which would otherwise cause undesirably high combined carbon. Ordinarily approximately 2 per cent of silicon is used for such work, while as little as 1 per cent is sufficient for the heaviest classes of castings.

High sulphur tends to increase the amount of combined carbon and is best kept low not only for this reason, but because it causes shrinkage and promotes the formation of blow-holes, especially when dull metal is encountered. However, the evils attributed to high sulphur are frequently greatly magnified. For light work sulphur of 0.10 per cent will give satisfactory results if the metal is poured hot and the manganese is kept fairly high. Heavy work may carry 0.12 per cent sulphur without causing trouble; in fact we have frequently analyzed samples running as high as 0.15 per cent and found no difficulty in obtaining sound castings which were readily machinable. It is, of course, advisable to keep the sulphur as low as possible for the sake of cleaner metal, but no one should become hysterical over a few points, other conditions being favorable.

Manganese and Phosphorus

As regards manganese there is a mistaken notion that it hardens gray iron, and semi-steel also, by increasing the combined carbon. It is true that it does ultimately have such an effect, but this property will not exert its influence until the amount of manganese is raised to considerably over 1 per cent. In practice we aim to keep the manganese relatively high, 0.75 to 1 per cent, but have never encountered difficulty up to as high as 1.25 per cent. Less than 0.75 per cent of manganese is not advisable in semi-steel, as its powerful desulphurizing and deoxidizing effects do not come into play to any extent below that point.

Phosphorus has no direct bearing upon the condition of the carbon, but if relatively high it is liable to cause segregation and thus reduce the strength of the mixture. In semi-steel the phosphorus may vary from 0.20 to 0.50 per cent, depending upon the class of work to be made. For close-grained castings subjected to high pressures, as in our case, 0.20 per cent phosphorus or even less gives very good results. The only objection to low phosphorus is loss of fluidity, but if the iron is melted hot and poured promptly no difficulty is experienced in obtaining strong, sound castings.

Total Carbon

Granting now that a given gray iron mixture is prepared which contains the proper quantities of silicon, sulphur, phosphorus and manganese to produce the ideal combined carbon of 0.75 per cent, we can produce a still stronger mixture by lowering the total carbon. This is in reality what we do when we add steel scrap to the gray iron mixture, and this is the outstanding difference between ordinary gray iron and semi-steel. Owing to the fact that an indefinite amount of carbon is always taken up by the metal from the incandescent coke within the cupola, the regulation of the total carbon in the resulting castings is not an easy matter. When, however, all raw materials are carefully analyzed and good cupola practice is adhered to, the total carbon can be kept within fairly narrow limits. We have found 3 to 3.25 per cent total carbon to be ideal.

In conclusion, while all of the factors discussed are essential to good semi-steel practice, all or any of them will be futile if the foundry organization as a whole will not cooperate with the chemist. The latter must be able to inspire respect and to retain it. If he is able to produce continuously good results, this becomes a simple matter, but if difficulties are met with it frequently becomes anything but simple. Fortunately the major portion of the black cloud of prejudice which enveloped all foundry chemists not so very many years ago has been largely dissipated by good work done, and it is to be hoped that, as time goes on, better and better relations may be established and consequently better results obtained.

Eight-Hour Day Summarily Established

Sweeping Changes Made by Carnegie Steel Co.—Advances in Cost May Not Be So Large as First Estimated—Revisions of Plans Expected

(Staff Correspondence)

PITTSBURGH, Aug. 14.—Two developments mark the present sweeping movement to carry the iron and steel industry into three eight-hour shifts on continuous operation. One is that the Carnegie Steel Co. is blazing the trail, putting its coke ovens, blast furnace plants and steel mills all on the 8-hr. basis on the termination of the 13-hr. turns at 7 o'clock Thursday morning, Aug. 16. The other is that there will be a rigid adherence to the 8-hr. turns, even if it becomes necessary to shut down any units of the different works, which is to say that production is secondary at the moment to getting the machine working in the new way. Preliminary observations show that the operating officials are entering on the new régime in a wholehearted fashion with a will to overcome obstacles and no thought that such as develop will long remain in the way.

Other subsidiaries of the United States Steel Corporation are not necessarily making the change in the summary manner of the Carnegie company, and many independent companies as yet have hardly delved into the paper part of the problem of realining the forces and ascertaining where new men must be put and how many there will be of them. The industry generally will watch closely what happens at the Carnegie plants, and naturally every experience will be studied for its bearing on plants preparing for the change or now making the transformation gradually, department by department.

How Employees Will Take the Change

There is a great deal of uncertainty as to the attitude of different classes of employees to the readjustments of wages. Alongside one another will be the former long turn men, now on 8-hr. shifts at a 25 per cent advanced hourly wage; and single shift or day men, say, whose hours remain the same or may be reduced an hour or so but whose hourly wage rate continues without change. Plants still operating on the two shifts (more commonly 11 hr. in the daytime and 13 hr. for the night) are expected to have dissatisfied men applying for employment, and on the other hand Carnegie operating men probably look for applications from men who do not wish to work more than 8 hr. Some of these, it is believed, are not now in the steel trade and averaged up will prove to be of a higher caliber than men now employed and of a type sorely needed.

Operating officials freely admit they undoubtedly will modify their personnel schedules repeatedly before they can hope to arrive at the practical ideal under the conditions. The outstanding fact is the will on the part of the management to establish the short turn. The bulk of the operating forces, so far as it has been possible to gage sentiment, is in a receptive mood, the doubtful cases being those unchanged in the wage scales whose minds may dwell on the differences in hourly rate more than on the differences in the character of the work under the new arrangement.

The New Régime at Blast Furnaces

A somewhat close study of a blast furnace plant would indicate that an increase of 15 per cent in the number of employees will suffice, not including a few additional salaried men. The total labor cost, considering wage earners, may not be increased more than 10 or 11 per cent, seeing that the 12-hr. workers (that is, the alternating 11 and 13-hr. workers) take a daily wage reduction of 16 2/3 per cent, while many will continue at present scales and even do their regular tasks in less time than formerly, in other words in the same work periods as the 8 or 10-hr. groups.

Against a theoretical increase of 50 per cent in the numerical strength of the force, in changing from two to three working groups for every 24 hr., even in the blast furnace department proper, to take a particular case, the actual expansion may not reach 35 or 40 per cent. The plan may do with one, two or three less blowers in one of the day shifts, depending on the size of the plant, for there is the general foreman as well as higher plant operating officials available for supervision at such times. Against four helpers at the cast house for the long shift, three will probably suffice.

A blower, getting under the three-shift plan 60c. per hour and presumably under the two-shift plan 75c. per hr., is an item in the labor cost. A labor force 35 or 40 per cent larger than in the two-shift régime at five-sixths of the daily wage of that régime (the men getting 25 per cent more per hour but for 8 against 12 hr. = 1.25 x 8/12 = 0.83) means that the increased labor cost of the blast furnace department proper—not including ore handling, or the yard switching, or handling of the burden, or the electrical, mechanical or other divisions of pig iron manufacture—is 1.35 x 5/6 = 1.125, or 1.40 x 5/6 = 1.166, or a mean of 14½ per cent, which is the estimate of one efficient blast furnace plant of moderate size, for just the furnace workers themselves, as stated.

Increased Labor Cost Around Ten Per Cent

It is when the whole blast furnace plant is considered that a better idea is gained of the cost features of the change. A curious point is that among what may be called the auxiliary occupations of the blast furnace—a group taking perhaps 40 per cent of the whole blast furnace department—increases among the numbers which must be present at every shift are offset by the reduced labor cost of others who will work 10 hr. per day at unchanged rates against former work periods of 11 hr. Added to this 40 per cent is 15 per cent not affected by the continuous process, as those engaged in yard switching, car dumping and the like. With this 55 per cent and 25 per cent engaged at the furnaces there remains 20 per cent in the electrical and mechanical departments, and in the laboratory and in recovering and handling of flue dust. A rough survey indicates that a labor cost increase for the last group of 20 per cent so that the total increased labor cost of making pig iron promises to be as follows:

0.55 (of total labor force)	x 1.00 (cost factor)	= 0.55
0.25	x 1.15	= 0.29
0.20	x 1.20	= 0.24
1.00		1.08

or 8 per cent increased cost.

It seems safe, therefore, to conclude in the light

of this survey that the labor increase in making pig iron in the sizable and efficient plant will not exceed 10 per cent. Thus, if pig iron costs $1 or $1.50 per ton for the labor to make it, the new cost will range between $1.10 and $1.65. This leaves quite a margin for steel making and steel rolling to make the increased cost of steel as much as $4 a ton. In some quarters it is believed the increment may be kept down to $2.

Day's Earnings May Change Little

One reason why there may be trouble on the score of wages is that the average daily wage will not be reduced as much as 6 per cent while the 8-hr. turn men take a 16 2/3 per cent reduction. Thus there is a 10 per cent increase in labor cost for a 15 per cent increase in labor force, or an average wage of $1.10 \div 1.15 = 95.6$ per cent of what it formerly was. For example, the average daily wage for all the men may have worked out under the long turn at $5.10 per day. Now it may average $4.90 or only 20 cents less. Yet the expectation of trouble has been that those getting no hourly wage advance will put in the first claims for reconsideration of their status. But after all there are relatively few of them. A blower at 53½c. per hr. getting $6.42 for 12 hr. will now receive $5.36 at 67c. per hr. for 8 hr. A tuyere foreman who has been receiving $5.89 for 11 hr. will go to 10 hr. a day and probably at the same rate or $5.35 per day. A pig machine man at 43c. per hr. for 12 hr. would receive $5.16 per day; now at 53.5c., say, for 8 hr. he receives $4.28. A stove cleaner foreman at 43½c. for 11 hr. received $4.79 per day and now at 10 hr. will get $4.35. These comparisons are perhaps far of the mark, seeing that men working together are treated alike and any cases of disproportionate wage adjustments are few in number and not likely to affect materially the net result. In fact, surveyed generally it would seem that fears of discontent on the score of partiality have been magnified.

Scheme for Changing Shifts

One plan in respect to the change of shifts is to make the change every two weeks and in the middle of a week. At the time of the coming off at, say Thursday morning, of the 11 p. m.-7 a. m. shift of the day before, the shift which has been resting for eight hours comes on and is then followed again by the former 11-7 shift. Then at 11 p. m. comes on the shift which took the 7 a. m.-3 p. m. shift of Wednesday. In other words, every two weeks, one shift is off for 32 hr. and the other two shifts alternate 8 hr. on and 8 hr. off. Then for two weeks the shifts go unchanged, each working 8 hr. and having 16 hr. off. At the end of the two weeks, a new shift is idle for 32 hr. and the other two alternate as stated, 8 hr. on and 8 hr. off. Thus a given shift has 32 hr. free every six weeks and in the intervening periods works for two weeks from 7 to 3 o'clock in the daytime; then for two weeks 3 p. m. to 11 p. m., and then two weeks from 11 p. m. to 7 a. m. The accompanying table shows the scheme.

As is to be noted, this arrangement is for a seven-day week operation, applicable to such a continuous plant as a blast furnace or coke oven installation. It means that for two Sundays a given man is free from 7 a. m. until 11 p. m. On two other Sundays he is free after 3 p. m. and on two other Sundays has daylight until 3 p. m. In short, even allowing for sleep, every man can have some daylight for himself and family on every Sunday of the year. Shift changing in midweek helps to this end.

One reason for changing the shifts in the middle of the week (every two weeks) is to minimize opportunities for dissipation which might be offered, considering the numbers ordinarily idle over a week end in an industrial community. The provision corresponds to the fixing of pay days at times calculated to protect a man against himself.

SCHEME FOR CHANGING SHIFTS ON THE THREE SHIFT SYSTEM

First Period of Two Weeks

	8 hr. beginning 7 a. m.	8 hr. beginning 3 p. m.	8 hr. beginning 11 p. m.
Thurs., Aug. 16	1	2	3
Rotation of shifts repeated for 13 days, thus:			
Wed., Aug. 29	1	2	3

Second Period of Two Weeks

Thurs., Aug. 30	2	3	1
Rotation repeated for 13 days. On Aug. 30 Shift No. 2 will work 8 hr. after 8 hr. rest and Shift No. 3 likewise 8 hr. after 8 hr. rest; then each has 16 hr. rest. Meanwhile Shift No. 1, quitting work at 3 p. m., Aug. 29, will not resume until 11 p. m. Aug. 30, an interval of 32 hr. The relation of shifts on the fourteenth day of the second period is:			
Wed., Sept. 12	2	3	1

Third Period of Two Weeks

Thurs., Sept. 13	3	1	2
Rotation repeated for 13 days. Shift No. 3 will again have two work periods of 8 hr. with an intervening rest of 8 hr. but Shift No. 2 will now have the 32 hr. holiday interval and Shift No. 1 will do as Shift No. 3. Then the rotation remains, the relation at the end of the period being.			
Wed., Sept. 26	3	1	2

Cycle Repeated

Thurs., Sept. 27	1	2	3
Shift No. 3 now gets the 32 hr. interval, so that each shift gets a respite from work every six weeks and without a break in the continuity of earnings.			

This review of what is being done to bring about the 8-hr. day covers only some of the high spots. It is not necessarily a picture of the average procedure and the problems peculiar to coke and steel making are hardly glimpsed, but it certainly ought to be convincing of the steadfastness of purpose of the iron and steel makers to consummate an epoch-making industrial change in a period of time thought impossible a short while ago and of a complexity not thoroughly understood even in high quarters. W. W. M.

Preliminary Steps in Twelve-hour Day Elimination

PITTSBURGH, Aug. 13.—Carnegie Steel Co. will begin the elimination of the 12-hr. day at its plants on Aug. 16, the beginning of the second pay period of the month, and while no official announcement has yet been made by other Steel Corporation subsidiaries here, the common impression is that they also will inaugurate the change in those departments of continuous operation, beginning with the blast furnaces, on the same day. Meanwhile, the independent steel companies, with the exception of those in the Youngstown district, which already have the shorter workday partially in effect, and the operators of merchant furnaces, despite numerous conferences and discussions of the matter, appear to have arrived at no definite plan of action, nor as to when the change will be made. Apparently, it is the intention of these interests to study the matter further and be guided in their course by the results attending the Steel Corporation efforts.

The Steel Corporation plan apparently calls for the setting up of three 8-hr. shifts in the blast furnace, open-hearth furnace and coke oven departments, in the order named, as promptly as possible and to the extent of the available labor supply. If the labor supply is sufficient, there will be three crews of the same num-

(*Continued on page* 423)

COST OF PRODUCING PIG IRON

Tariff Commission Investigation to Determine Whether Duty Needs Changing

WASHINGTON, Aug. 14.—Investigation by the Tariff Commission as to costs of production of pig iron in the United States has been almost completed. The final work is being done in the Pittsburgh and Youngstown districts and is expected to be finished this week. It is being done under the direction of Paul M. Tyler, head of the iron and steel division of the commission, and is the outgrowth of an application of Eastern merchant blast furnace interests for an increase in the duty of 75c. per ton. Under the flexible provisions of the Fordney-McCumber act the President is authorized, after an investigation to raise or lower duties by a maximum or minimum of 50 per cent. An increase of 50 per cent in the present duty on pig iron would raise it to $1.125 per ton.

The investigation into the producing cost has embraced all of the principal producing sections of the country and has been devoted largely to costs at merchant stacks, although it also has covered to some extent costs at steel works furnaces. Cooperation by producers in giving the commission desired information has made it possible to get a comprehensive survey of the entire situation.

Upon completing the work in this country Mr. Tyler, with his staff, will undertake a similar investigation in competing countries in Europe. It has not been determined when the work in Europe will be begun, but it is likely it will be in the near future. Also, it is not known what the attitude of foreign pig iron makers may be with regard to giving costs and other data to the American tariff agents, but it is believed that, on the whole at least, the latter will be accorded the desired cooperation. In this connection, it is felt that the absence of such assistance from foreign makers might be construed to mean that production costs in Europe are so low as to justify a higher duty for the protection of American makers, who are faced with greater costs.

While the maximum increase under the flexible provisions in the duty on pig iron could be only 37.5c. per ton, it is understood here that a number of blast furnace operators feel that this in itself would be helpful, and particularly so in a sharply competitive market. Manifestly, there can be no present indication as to what the attitude of the Tariff Commission may be on this subject. It can be known only after hearings, which will follow the investigation abroad. It has been pointed out, however, that in the event an increase in duty were held to be justified, and the contention made that a 50 per cent advance over the present duty would be insufficient, it still would be possible to resort to Congress to increase the rate. But when the character of the next Congress is called to mind, it plainly is altogether speculative as to what it might or might not do concerning readjustments of the tariff.

President Coolidge is said to be a stronger protectionist than was the late President Harding, but even though he should be sympathetic toward an increase on pig iron rates, over and above that which could be made through authority given him in the flexible provisions, it is a question as to how far he could go in getting Congress to change rates.

Regardless of what may be the outcome of the pig iron investigation, interest in it has been stimulated by figures showing that imports of pig iron for the fiscal year ended June, 1923, reached the unprecedented total of 655,286 gross tons, while for the first six months of the present year they were 298,240 tons, which also set a record, though since March the imports have declined sharply.

American Files and Razor Blades Well Received in England

WASHINGTON, Aug. 14—In THE IRON AGE of June 7 was published an abstract from a report of the American consul in Sheffield, England, in which the statement was made that the American file is more popular among users in Great Britain that the British-made article because better steel is used for the American file. The Sheffield *Daily Telegraph* on June 23 makes the following comment on this statement:

"An American consular report claims that the American file is more popular among users in this country than the British-made article, for one reason because better steel is used for the former. We learn that some of the American files are made of Sheffield steel, shipped to England, and sold cheaper than Sheffield files. This is, of course, a partisan view of the subject which our own makers would not agree with.

"All the same, American competition in files seems to be very formidable in the British colonies and foreign markets, while the home trade for files is about as bad as it can be. The position has recovered somewhat from the extreme depression of last August, but not sufficiently so to occupy half the machinery installed for producing the goods. In a condition when available trade will not go around, severe competition, accompanied by cutting prices to the bone, is inevitable, and that is what is now happening. Making files was never profitable in the old days, except in the matter of acting as a feeder to other branches of the steel trade, but we doubt whether a tenth of the firms engaged in the trade are now earning profit."

Consul William J. Grace supplements his previous report regarding files by making a similar statement as to quality of American safety razor blades. His comment follows:

"That which has been reported by this consulate in reference to files may also be said concerning American safety razor blades, except perhaps in respect to price. In the many trade discussions here urging the adoption of mass production and the use of improved machinery in the manufacture of cutlery, including razors, the excellence of the quality, workmanship and keen cutting edge of the American safety razor blade has always been emphasized. Large quantities of razor blade steel, made and rolled in Sheffield, are shipped to the United States, and a certain proportion of this steel comes back here in the form of safety razor blades, under well-known American trade names, which are sold over the counters of the various shops in this city."

Import Duty on Magnesite Attacked

WASHINGTON, Aug. 14.—Acting upon the application of Austrian producers, the Tariff Commission yesterday ordered an investigation into costs of producing magnesite in the United States and abroad. It is said that some American consumers of magnesite also were interested. While the commission did not give out the nature of the application, made under the flexible provisions of the tariff act, it is understood that it seeks to have a reduction made in the duty on grain magnesite, which was fixed at 23/40c. per lb. in the Fordney-McCumber tariff law and which was the subject of prolonged hearings when the tariff was being drafted, and of debate when it was before Congress. Iron and steel interests, together with importers of magnesite, sought to have the duty reduced, while domestic producers of magnesite attempted to have the duty increased above the rates determined upon.

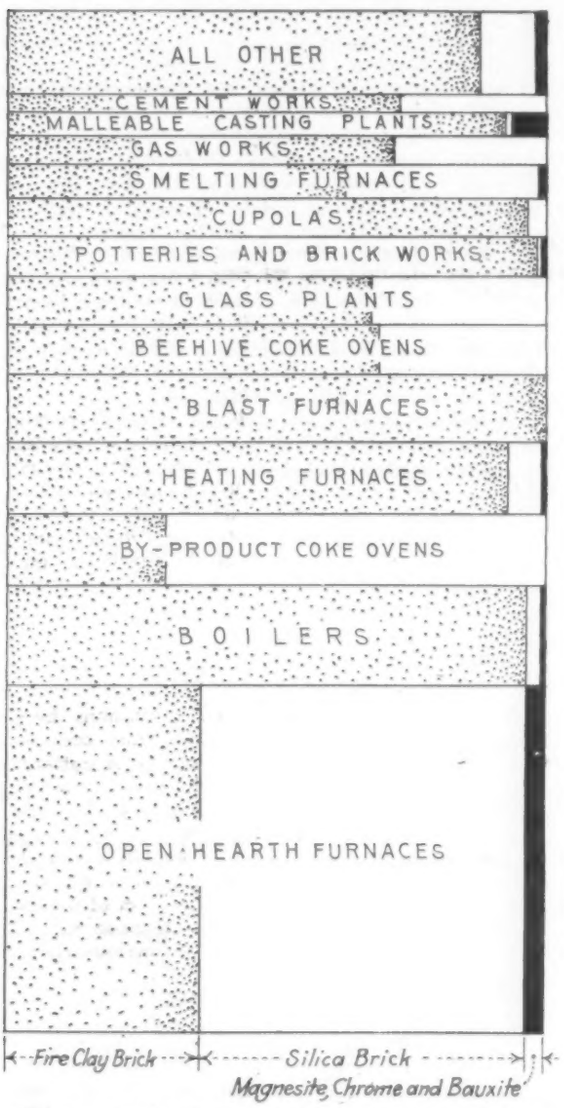
The investigation will cover all magnesite included in the magnesite paragraph, including crude, with a rate of 5/16c. per lb.; caustic calcined, with a rate of ⅝c. per lb. and grain. The application for an investigation was made by the following concerns: Vertischer Magnestwerke Actien Gesellschaft, Austrie-Armenian Magnesite Co., and Ateirusche Magnesite Industria Actien Gesellschaft.

WHERE REFRACTORY BRICKS GO

Open-Hearth Furnaces Take One-third, Boilers Almost One-tenth, Blast Furnaces, Heating Furnaces and By-Product Coke Ovens About One-Fifteenth Each

On the basis of partial returns from the companies producing refractory brick in the United States, an analysis has been prepared showing the proportion of the output of the companies reporting which goes to various industries. Each table covers, separately, fire clay brick, silica brick and a group of miscellaneous brick, including magnesite, chrome and bauxite. Eighteen separate industries are listed, with miscellaneous items following. The figures are all on the basis of 9-in. equivalents. They thus represent production in quantity rather than in sales value or dollars.

As the figures are presented they are on a percentage basis, both with regard to the total production of all three groups of bricks, and with regard to the production of each separate kind.



Distribution of Refractory Brick in the United States. Vertical space shows proportion of total brick absorbed by the agency named; shaded areas show the proportion, within each user, of each kind of brick. The dotted areas are fire clay; white areas, silica; black areas, magnesite, chrome and bauxite brick

Iron and Steel Electrical Engineers' Convention Papers

Papers to be presented at the annual convention of the Association of Iron and Steel Electrical Engineers, Broadway Auditorium, Buffalo, Sept. 24 to 28, follow:

"Special Control for Ore Bridges with Special References to Wind Velocities," by Paul Canney, electrical engineer Minnesota Steel Co., Duluth, Minn.

"Systematizing the Work of the Electrical Engineering Division," by P. T. Vanderwaart, electrical engineer New Jersey Zinc Co., Palmerton, Pa.

"Electric Transportation in Steel Mills," by F. O. Schnure, electrical superintendent Bethlehem Steel Co., Sparrows Point, Md.

"Economical Use of Fuel in the Steel Plant," by H. C. Seibert, fuel engineer Bethlehem Steel Co., Bethlehem, Pa.

"Electrically Operated Centrifugal Pumps," by B. A. Cornwell, electrical engineer Carnegie Steel Co., Youngstown, Ohio.

"Slip Regulators," by D. M. Petty, electrical engineer Bethlehem Steel Co., Bethlehem, Pa.

Committee reports include:

"Electrical Developments," by W. Kennedy, power engineer Worth Steel Co., Claymont, Del.

"Standardization," by F. W. Cramer, engineer of tests Bethlehem Steel Co., Johnstown, Pa.

"Safety," by Walter Greenwood, safety engineer Carnegie Steel Co., Youngstown, Ohio.

"High-Pressure Steam Boilers," by D. S. Jacobus, consulting engineer, Babcock & Wilcox Co., New York.

"Automatic Engine Stops," by Walter Greenwood, safety engineer Carnegie Steel Co., Youngstown, Ohio.

"Electric Furnaces," by E. T. Moore, electrical engineer Halcomb Steel Co., Syracuse, N. Y.

"The Tempering of Coal," by T. A. Marsh, chief engineer Green Engineering Co., Chicago.

"Surface Combustion," by W. N. Hepburn, vice-president Surface Combustion Co., New York.

"Electrification of the Iron and Steel Foundry," by L. W. Egan, consulting engineer, Cleveland.

"Skip Hoists," by A. C. Cummins, electrical engineer Carnegie Steel Co., Duquesne, Pa.

"Boiler Troubles from the Operating Man's Standpoint," by Carl Smith, fuel engineer Inland Steel Co., Indiana Harbor, Ind.

	Total	Fire Clay Brick		Silica Brick		Magnesite, Chrome and Bauxite Brick	
		of Total	Separate	of Total	Separate	of Total	Separate
Iron blast furnaces	6,688	6,688	10,176	.....	.....	.....	.....
Open-hearth furnaces	34,182	12,418	18,888	20,760	63,089	1,004	73,334
Heating furnaces	6,942	6,455	9,820	460	1,397	27	2,000
Crucible furnaces	306	77	118	183	555	46	3,333
Electric furnaces	499	301	459	184	560	14	1,000
Cupolas	3,643	3,537	5,382	106	324	.....	.....
Malleable casting plants	2,279	2,127	3,236	15	46	137	10,000
Beehive coke ovens	4,835	3,344	5,088	1,491	4,533	.....	.....
By-product coke ovens	7,072	2,033	3,094	5,039	15,311	.....	.....
Boilers	9,594	9,351	14,228	216	657	27	2,000
Smelting furnaces	3,221	2,018	3,072	1,157	3,515	46	3,333
Gas plants	2,798	1,976	3,006	822	2,498	.....	.....
Chemical plants	1,422	1,422	2,163	.....	.....	.....	.....
Cement works	1,898	1,405	2,139	493	1,498	.....	.....
Lime plants	1,530	1,091	1,661	439	1,332	.....	.....
Potteries and brick works	3,929	3,921	5,966	1	3	7	500
Glass plants	4,757	3,223	4,905	1,534	4,662	.....	.....
Railroads	887	879	1,339	1	2	7	500
Miscellaneous	3,518	3,457	5,260	6	18	55	4,000
Total	100,000	65,723	100,000	32,907	100,000	1,370	100,000

FOUNDRYMEN OFF FOR EUROPE

Delegation to Paris Convention Sailing Aug. 18—A British Tour Also

With the sailing of the Leviathan from New York on Saturday, Aug. 18, a number of foundrymen and representatives of foundry equipment companies start on a tour having as its main objective the International Foundrymen's Congress and Exhibition, which will be held in Paris, Sept. 12 to 15. As indicated in the tentative itinerary published in THE IRON AGE of July 5, the tour will include a stay of from two to three weeks in Great Britain, during which visits will be made to Sheffield, Manchester, Birmingham and other centers of interest to members of the metal-working trades. Following the congress at Paris, another tour has been arranged to industrial centers of France and Belgium.

Below is given the list of those who are to make the trip. Most of them are going on the Leviathan, but some have booked by other steamers and will join the main party in Paris:

G. W. Knotts, United Engineering & Foundry Co., Youngston, Ohio, and Mrs. Knotts.

Verne E. Minich, president American Foundry Equipment Co., New York, and Mrs. Minich.

John Hill, Hill & Griffith Co., Cincinnati, and Mrs. Hill.

Edward W. Campion, Buckeye Steel Castings Co., Columbus, Ohio.

J. S. McCormick, J. S. McCormick Co., Pittsburgh, and Mrs. McCormick and two children.

Q. S. Snyder, vice-president Pittsburgh Rolls Corporation, Pittsburgh.

G. H. Clamer, Ajax Metal Co., Philadelphia, president American Foundrymen's Association, and Mrs. Clamer and daughter.

Dr. Richard Moldenke, Watchung, N. J., formerly secretary American Foundrymen's Association, and Mrs. Moldenke.

Walter Wood, R. D. Wood & Co., Philadelphia.

C. S. Gilbert, Canada Iron Foundries, Ltd., St. Thomas, Ontario, and Mrs. Gilbert.

Jesse L. Jones, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

C. H. Gale, Cleveland Ohio.

L. L. Anthes, Anthes Foundry, Ltd., Toronto, Canada.

Stanley G. Flagg, Jr., Stanley G. Flagg & Co., Philadelphia.

Henry M. Lane, president Henry M. Lane Co., Detroit.

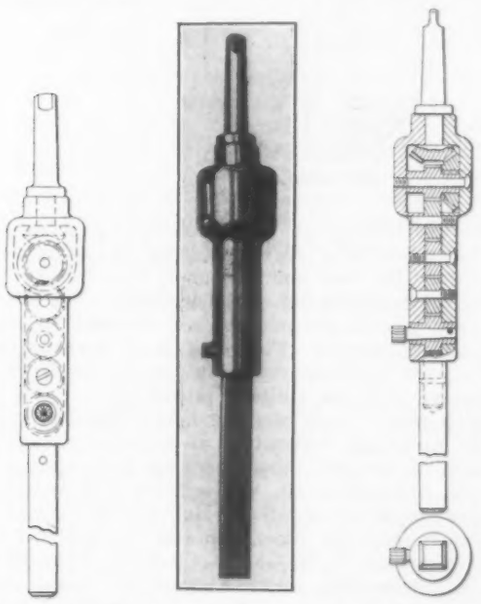
George H. Wadsworth, Wadsworth Core Machine & Equipment Co., Akron, Ohio, and Mrs. Wadsworth.

Arthur F. Braid, Metal & Thermit Corporation, New York.

The Leviathan party will arrive at Southampton on Friday, Aug. 24. Saturday will be spent at Windsor, and Monday will be given up to plant visitation in the London district. Tuesday the party goes to Sheffield and the next two days will be spent there and in nearby districts. On Friday evening at Manchester a dinner of welcome will be given by the National Ironfounding Employers' Federation. The party will remain in Manchester, visiting plants there and in outlying districts until Sept. 4, when it will take train for Birmingham. Various excursions will follow, and on Saturday, Sept. 8, a return will be made to London. The party leaves London for Paris on Tuesday, Sept. 11, in company with members of the Institution of British Foundrymen.

Internal Keyway and Slot Milling Attachment Used with Drilling Machine

A device known as the Campbell internal keyway and slot miller attachment for use with drilling machines in the rapid and accurate cutting of keyways in



Attachment for Cutting Keyways in Shaft Holes of Pulleys and Gears. Arrangement of cutter driving gears, and location of cutter and guide rod are shown in the sectional views

the shaft holes of pulleys and gears has been placed on the market by the Campbell Machinery Corporation, Leechburg, Pa. The device is described as capable of transforming a drilling machine into an internal keyway cutter of a new type.

The construction of the attachment may be noted from the illustrations. The body is hollowed out to accommodate a system of gears, arranged as shown, which transmit the revolving motion of the machine spindle to the lower gear containing the end milling cutter. Cutters are provided with taper shanks to facilitate easy insertion and removal, and are available for all sizes of keyways up to the capacity of the attachment.

The device includes a square rod portion, as shown, which moves up and down in a square guide hole cut in the machine table, and serves to support the lower end of the attachment and prevent revolving of the body. A vise has been designed to hold and advance the work into the cutter if more than one "cut" is required in machining the keyway. This vise is provided with a suitable hole for the square rod, and its use obviates the necessity of altering the machine itself.

The work to be machined is placed on the table of the machine or in the vise and the attachment placed with its taper shank in the spindle of the machine and the square rod in its guide. After locating the work so that the keyway or slot will be cut in the desired place, it is then clamped. The drilling machine is started and the cutter lowered into the work by means of the feed mechanism of the machine.

The attachment is said to have been found to remove stock as rapidly as standard vertical milling machines using a cutter of the same size, the keyways cut also being accurate as to size and smooth of finish. Two sizes are available, type A2 for keyways up to ¾ in.; minimum diameter of hole, 1⅝ in., and length of hub 4½ to 9 in. long, as ordered. The type A3 is for keyways up to 1½ in., in holes 2⅝ in. diameter, minimum, and hub lengths of 8 to 12 in., as ordered.

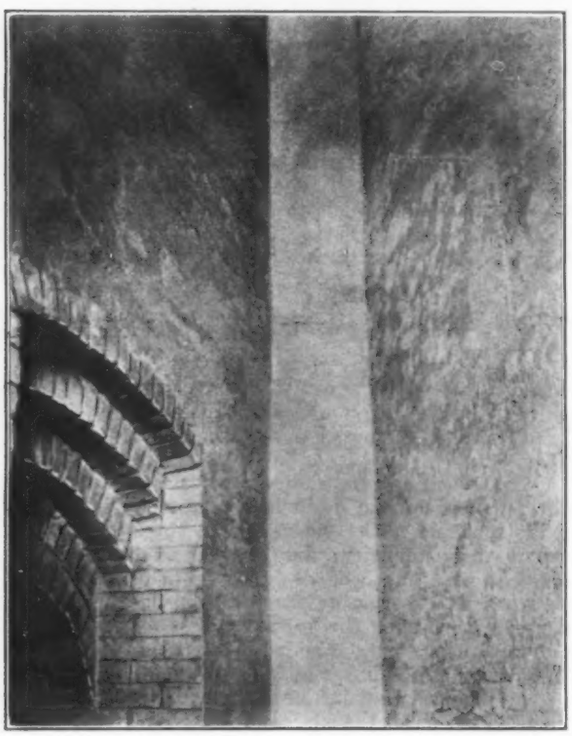
It is understood that a complete machine tool is in the process of development which will also permit of milling the teeth of annular gears, as well as the cutting of keyway and slots.

Members of the National Screw Thread Commission were in session at Greenfield, Mass., the past week, business meeting being held at the Weldon Hotel. There were various discussions on standardization and other matters of interest to the commission, which comprises Dr. G. K. Burgess, director, Bureau of Standards; H. W. Bearce of the bureau; Commanders J. N. Ferguson and M. A. Libbey, United States Navy; R. E. Flanders, Jones & Lamson Machine Co., Springfield, Vt.; George S. Chase, Cleveland; Earle Buckingham, Pratt & Whitney Co., Hartford, Conn., and F. O. Wells, Greenfield.

Monolithic Lining for Hot Blast Stoves

The relining of the hot blast stoves using monolithic construction of refractories has been successfully applied to a two-pass side combustion stove at Hamilton, Ont., in the plant of the Steel Company of Canada. As a one-piece lining of large size, which has been through several months' continuous service, the installation is of unusual interest.

Old blast furnace linings were salvaged by crushing to uniform size and using all material which would pass through a ¼-in. mesh screen. Old bricks are particularly suitable for this work. In their initial service the impurities have been burned out and shrinkage removed. This material was added to diluted Hytempite, a high temperature cement, to form a stiff plastic material about the consistency of molding sand. Old fire bricks were used for building the wall to back up the monolithic lining, leaving header courses projecting. This brick work was first coated with a thin



Hytempite wash after dust and loose particles had been removed.

After diluting Hytempite in a mortar box to the consistency of pancake batter, the crushed old brick including the fines were mixed in until a molding sand consistency was reached. The proportions used were 50 lb. of Hytempite to each 100 lb. of crushed old fire brick. Forms were made of lumber about 1 in. thick and 30 in. of form in height were used at a time.

The mixture, made in suitable sized batches, was then rammed in behind these forms. A bonding coat of Hytempite batter was brushed over each section of the old brick work just prior to ramming the material. This served to tie the rammed material to the standing wall.

The size of the chamber lined is approximately 25 ft. in height by 15 ft. in longest axis. The drawing shows how the header courses support the monolithic lining which is 9 in. thick at the thinnest point and about 13 in. thick at the thickest point. At the gas tunnel entrance an arch of old fire brick was sprung as shown in the half-tone illustration to support the monolithic lining at this point until thoroughly dry.

As each 30 in. section was rammed the forms were removed and raised 30 in. for packing the next section. This procedure was followed until the top of the wall was reached. After the walls were completed they were allowed to air dry for 24 hr. and then the entire surface covered with a wash coat of Hytempite batter to give a smooth hard finish to resist hot gas action.

The blast furnace was blown in on Jan. 2, 1923, and the stoves have been in constant operation since. To secure the photograph reproduced the camera was lowered from the top of the inside wall, the position being indicated in the diagram of the lining.

The lining was installed under the direction of H. G. Hilton, superintendent of the plant with the assistance of W. H. Gaylord, Jr., field service engineer of Quigley Furnace Specialties Co., New York.

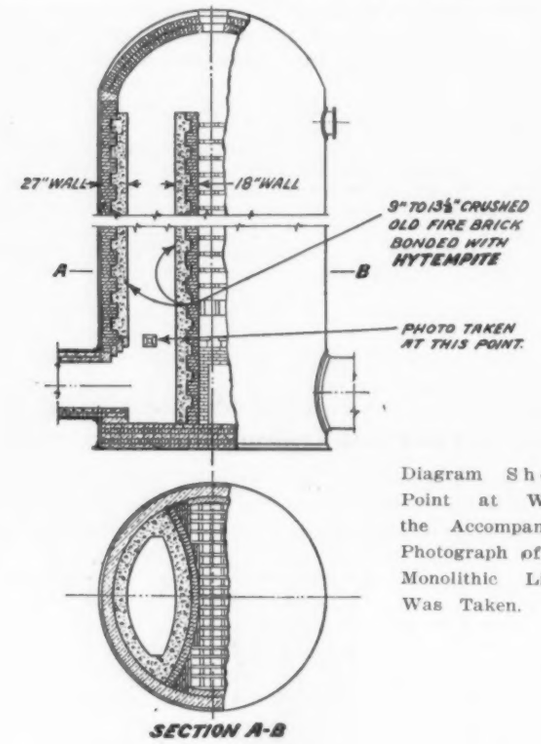


Diagram Shows Point at Which the Accompanying Photograph of the Monolithic Lining Was Taken.

Efforts to Organize Steel Workers to Continue

Efforts to unionize the steel industry will not be checked by the abandonment of the 12-hr. day, according to William Hannon, the general organizer of the American Federation of Labor, now making his headquarters at Chicago. He is quoted as follows: "When the fact that we have started to organize the steel workers is sufficient to cause a promised reduction in the hours of workers from twelve to eight, there can be no question about the necessity for unionization. We have not fully formulated the demands we will make upon the steel manufacturers when we have completed the organization of the workers. The 8-hr. day has been one of the matters we intended to take up with the employers. Plenty of steel workers are attending the meetings which we are holding in steel centers all over the United States."

At a recent mass meeting held under the auspices of the American Federation of Labor at Gary Labor Temple, Gary, Ind., the following men spoke: John Turney, Springfield, Ill., of the Mine, Mill and Smelter Workers of America; E. J. Holley, Cleveland, of the Amalgamated Iron, Steel, Tin and Sheet Metal Workers Association; C. N. Glover, Chicago, of the Brotherhood of Blacksmiths, Drop Forgers and Helpers; Fred Detrick, president of the Gary Trades and Labor Assembly. A similar meeting was held at Waukegan, Ill.

According to a statement of the American Railway Association the railroads of the United States on July 31 had 76,453 surplus freight cars in good repair and immediately available for service if necessary, despite the fact that, during the week which ended on July 28, 1,041,044 cars were loaded with revenue freight, the largest number for any week in the history of the country. When a record loading of 1,018,539 cars was established during the week of Oct. 14, 1920, which record remained until this year, a shortage of 69,517 cars was reported.

BOOK REVIEWS

Construction and Use of Automatic Screw Machines. Pages 353, 6 x 9 in.; illustrated. Published by Brown & Sharpe Mfg. Co., Providence. Price, $1.

This volume gives a simple yet detailed description of the construction, operation and adjustment of Brown & Sharpe automatic screw machines and also of the tools and attachments used with them. It is offered in the belief that a machine tool cannot be operated efficiently unless it is thoroughly understood by those who handle it. It is intended to make clear that the principles of the machines are simple and the method of operation easily understood; that it is not a difficult matter to design and make cams, and to set up the machines, so that the greatest quantity of work can be produced in a given time, with the required finish and within consistently maintained close limits.

A chapter is devoted to a general explanation of how the machines operate, and another to the erection and care of the machine, which includes an arrangement of machines on shop floor, arrangement of overhead works and proper lubrication. Getting a No. 2 automatic ready for a job when the cams, together with the necessary tools and a drawing are furnished to the operator is clearly outlined and illustrated. Several pages are devoted to the construction and adjustment of the machine.

An outstanding chapter is on standard tools, what they are and how to use them, the success of the automatic screw machine being emphasized as depending to a great extent on the selection and setting of the tools used. The different types of tools are illustrated and the construction and use of these tools are given in detail. How to design cams for Brown & Sharpe machines is also an important chapter, and the instructions given, which are intended for foremen and mechanics, are easily followed. Data compiled in tables at the end of the book eliminate most of the figuring. A good understanding of the operation of the machine is essential, however, and experience in handling or study of the preceding chapters of the book should provide the necessary background knowledge. A chapter on how to machine the cams follows, and information on the use and construction of several standard attachments is also given. More than 90 pages of tables and a comprehensive index conclude the book.

This volume is a notable contribution to the literature of the subject. Those responsible for its preparation have succeeded in large measure, and the book undoubtedly will be much appreciated.

The Working of Steel. By Fred H. Colvin and K. A. Juthe. Size 6 in. x 9¼ in. Pages X + 245; 135 plates and illustrations. Second Edition. McGraw-Hill Book Co., Inc. Price $3.

This rather recent book by Colvin and Juthe has been so well received that a second edition has been called for. In order to obtain an idea of its scope the twelve chapters will be taken up briefly in order.

Chapter 1 of 12 pages is on Steel Making. The only good feature is the section on electric furnace practice. The sections on Bessemer, open-hearth and crucible are very brief and not always correct. No idea is given of the relative tonnage and importance of the various kinds of steel, nor the important uses of each kind.

Chapter 2 of 12 pages is on the Composition and Properties of Steels. On page 13 is given a table showing the relation of tensile properties to analysis which is rather misleading. For instance, a soft boiler plate steel of 0.08 to 0.10 per cent carbon would not usually show 60,000 lb. per sq. in. tensile strength. This chapter is also incorrect or misleading in some sections, and both Chapters 1 and 2 should be carefuly gone over by a good metallurgist before issuing a new edition.

The third chapter of 22 pages is on Alloy Steels. Here again some misleading statements are to be found, but the chapter has a very good section on stainless steels and another on the making of connecting rods for Liberty motors. A striking feature of these first three chapters is the virtual absence of references, which would be welcomed by readers because of the necessary brevity of the sections.

Chapter 4 of 18 pages is very interesting, and is on the materials used in the Liberty motor and their application to automotive purposes. Chapter 5 of 11 pages on Forging is very sketchy, but has a good section on a method for making rifle barrels, developed by one of the authors.

Chapter 6 of only four pages takes up Annealing. Chapter 7 of 26 pages and Chapter 8 of 40 pages take up Case Hardening and Heat Treatment. While there is a lot of repetition the first one is a good practical chapter. The next chapter is not carefully written; for instance, the usual conception of normalizing is not that of the authors: "Normalizing is a seating like annealing, followed by a moderately rapid quench." Also on page 108 the table is incorrect because a steel with no carbon would not show an arrest at 1330 deg. Fahr. In this chapter is an excellent section on the making and treatment of case-hardened gears, which should be included more properly in the chapter on Case Hardening.

The next chapter of 20 pages is on the Hardening of Carbon Steel Tools. It is a little disjointed, but very good, and is followed by a chapter on the Hardening and Treatment of High-Speed Steel, which appears to be a good compilation from the handbooks of various steel makers. Next comes a brief chapter on Furnaces, mainly covering furnaces for heating for hardening. An interesting feature is that electric furnaces are mentioned, but no examples are given, which is a serious omission. Finally comes a good chapter on pyrometers, of 29 pages.

It will be seen that there are a great many good features about the book, notwithstanding serious errors and misleading statements. It lays most stress on case hardening and the heat treatment of tools, and can be recommended to those interested in these subjects.

G. B. WATERHOUSE.

Steel Corporation's Orders Decrease

Unfilled business on the books of the United States Steel Corporation as of July 31 amounted to 5,910,763 tons, or 475,498 tons less than reported for June 30. During June business fell off 595,090 tons, in May 307,158 tons and in April 114,823 tons, while increases of 119,343 tons, 373,213 tons and 165,073 tons were shown respectively in March, February and January. A year ago the unfilled tonnage was 5,776,161 tons, or 134,602 tons less than on July 31, last. Following is the unfilled tonnage as reported by months since January, 1920:

	1923	1922	1921	1920
Jan. 31.....	6,910,776	4,241,678	7,572,164	9,285,441
Feb. 28.....	7,283,989	4,141,069	6,933,867	9,502,081
March 31.....	7,405,332	4,494,148	6,284,765	9,892,075
April 30.....	7,288,509	5,096,913	5,845,224	10,359,747
May 31.....	6,981,351	5,254,228	5,482,487	10,940,465
June 30.....	6,386,261	5,635,531	5,117,868	10,978,817
July 31.....	5,910,763	5,776,161	4,830,324	11,118,468
Aug. 31.....	.....	5,950,105	4,531,926	10,805,038
Sept. 30.....	.....	6,691,607	4,560,670	10,374,804
Oct. 31.....	.....	6,902,287	4,286,829	9,836,852
Nov. 30.....	.....	6,840,242	4,250,542	9,021,481
Dec. 31.....	.....	6,745,703	4,268,414	8,148,122

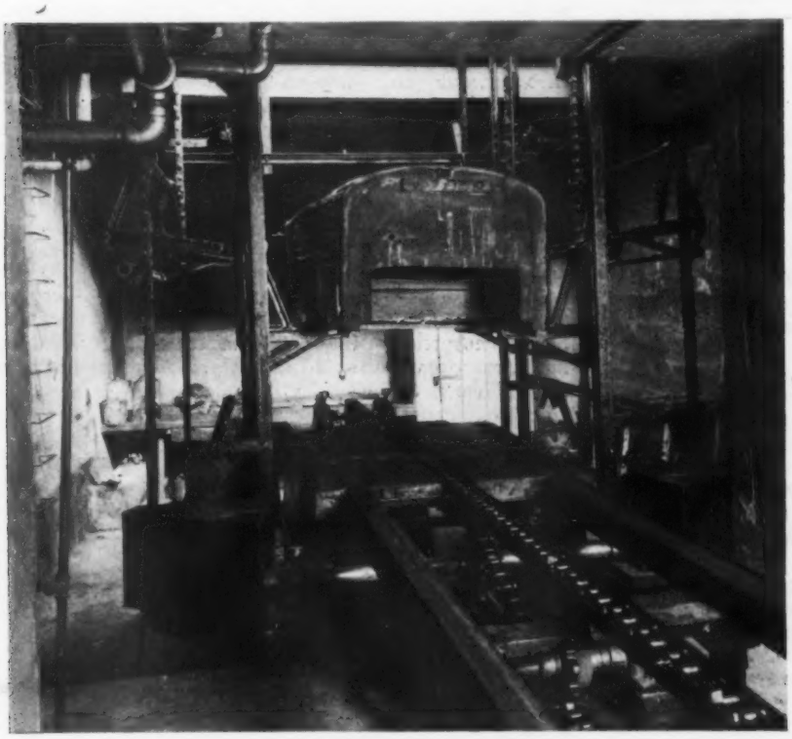
The largest total of unfilled orders was on April 30, 1917, at 12,183,083 tons. The lowest was on Dec. 31, 1910, at 2,605,747 tons.

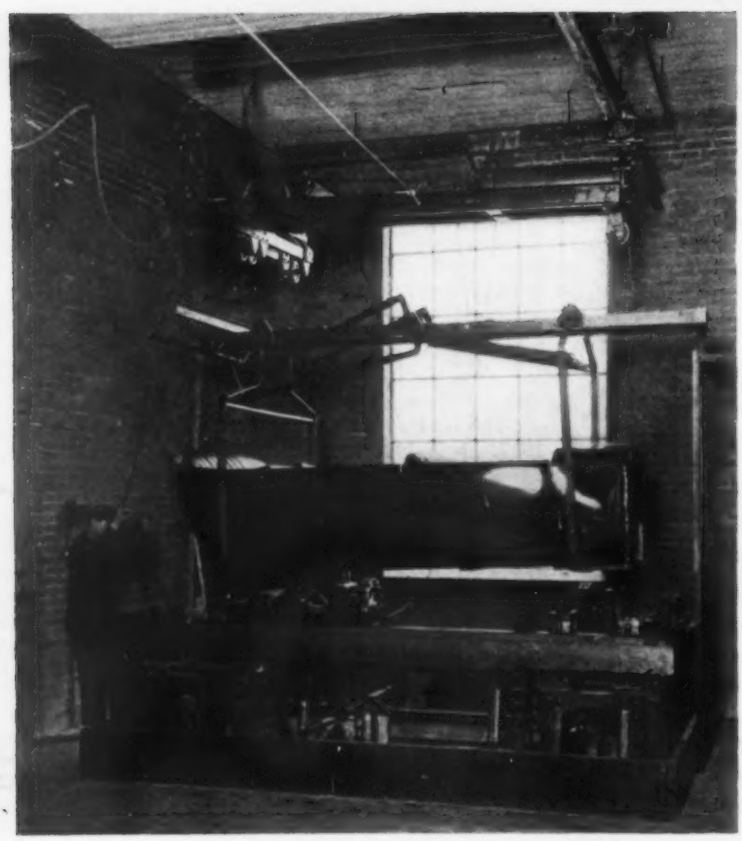
Stockholders of the Wheeling Steel Corporation postponed until Aug. 28 the special meeting called for Aug. 9, to take action on the closed bond issue of $75,000,000, secured by all the corporation's properties. The meeting scheduled for Aug. 9 had been postponed from a previous date because of lack of time for attorneys to prepare necessary forms for submitting the issue to the stockholders. The same reason caused the second postponement. The stockholders will be asked to execute a deed of trust to secure the issue and to authorize the issuance of $8,000,000 of convertible notes of the company, and to provide for the disposition of the bonds when authorized.

Conveying Automobile Bodies to Assembly

Efficient Handling Through Tunnel Under a Cleveland Street—Both Vertical and Horizontal Movement

CONVEYING equipment for various purposes is commonly used in the larger automobile plants and much of this has become standardized to a large extent. However, the arrangement of a plant often necessitates the use of handling equipment of a special type to meet the particular needs of that plant. This seems particularly true of equipment for handling automobile bodies, conveying equipment for which has not been standardized to the extent that it has for handling small parts or for assembling lines.





At Upper Left Is the Automatic Conveyor for Handling Finished Automobile Bodies in the Plant of the Chandler Motor Car Co., Cleveland. The endless chain vertical conveyor with attached arms carries the body from the fourth floor and deposits it on the horizontal conveyor, which carries it through a tunnel, at the opposite end of which it is picked up by another elevator

At Right Is the Horizontal Conveyor in the Tunnel

(At Left) After Being Elevated by the Last Conveyor, a Sling Grips the Body and It Is Raised by an Air Hoist and Moved Away on the Overhead Trolley and Deposited on a Body Truck on the Assembly Floor

The Chandler Motor Car Co., Cleveland, formerly conveyed its bodies on trucks from the fourth or finishing floor of its body department across a city street to the third floor of the assembling department. This was not an economical handling method and the company planned to build a bridge to connect the upper floors of the two buildings. However, the city refused to grant permission for a bridge over a public highway and the company's engineers were set to work to devise some other method of conveying the bodies.

Under the plan as adopted the two buildings were connected by a tunnel running under the street and a continuous automatic handling system was provided. This includes a special type of conveyor which lowers the bodies to the level of the tunnel under the body department, whence they are conveyed on a power conveyor through the tunnel to the assembling department. At the end of the tunnel another vertical conveyor similar to that used in the body department elevates them to the third floor of the assembling department. The distance covered is approximately a 75-ft. drop in the body department, 175 ft. through the tunnel and a 60-ft. elevation in the assembly department, and it takes 53 minutes to carry the body from its starting point to its destination.

The finished body is carried by hand-operated hoist to a point over the descending conveyor which is designed as a "lowerator." This consists of four endless chain conveyors, two chains six feet apart on each side of the elevator well operated by one driving unit. Attached to the chain 12 feet apart are arms on which the body is carried. The arms have a trip at the bottom and pass around the sprocket wheels that drive the chain and remain in the same position in their upward as in their downward course. The hoist drops the body on the projecting arms which carries it to the bottom of the shaft where it is deposited on the horizontal conveyor, the arms passing beneath the horizontal conveyor bed in their movement around the sprockets. A dog attached to the horizontal conveyor then comes in contact with the body and it is carried through the tunnel.

The horizontal conveyor operates at the same speed as the "lowerator" and the dogs are 12 feet apart or the same distance as the arms on the lowering mechanism. At the discharged end of the tunnel the dog is tripped and the body stands still a moment until the lifting arms of the elevator engage under it.

When the body reaches the top of the conveyor elevator it is gripped by a pair of steel slings. Lever-operated mechanism is provided for opening the arms of the slings and bringing them together under the body. The frame of the sling is suspended from an air hoist attached to a trolley, the track of which reaches over the elevator well. After the body is raised from the elevator it is moved away on the hand-operated trolley and deposited on a body truck.

The system has proved very efficient in the saving of labor and in the elimination of congestion of finished bodies on trucks as well as in the doing away of much handling by hand which often results in marring the finish of the bodies.

Ninth Annual Chemical Exposition

The chemical exposition this year is being held during the week immediately following the annual meeting of the American Chemical Society, as has been the custom in previous years. This society will meet during the week of Sept. 10 at St. Paul and, immediately after the close of the meeting, many of its members will entrain for New York in order to spend the week of Sept. 17 at the exposition. The usual meeting of the American Ceramic Society will be held in conjunction with the exposition in the Grand Central Palace on Sept. 19, probably extending over several days. The annual banquet and election of the salesmen's association of the American Chemical Industry will also be held during the week of the exposition, very probably at one of the Pershing Square group of hotels near the Grand Central Palace. The regular dinner during the Chemical Exposition of the American Institute of Chemical Engineers will be on Wednesday evening, Sept. 19, at the Park Avenue Hotel, reservation for which should be sent to Dr. John C. Olsen, the secretary, at 85 Livingston Street, Brooklyn, N. Y.

Steel Treaters to Hold Hardness Symposium

At Pittsburgh during the convention and international exposition of the American Society for Steel Treating to be held Oct. 8 to 12 the hardness committee of the National Research Council will again hold a symposium similar to the one this committee held during the convention at Detroit last year. The preparation of the program is under the direction of Major A. E. Bellis, president Bellis Heat Treating Co., New Haven, Conn., and he has been successful in arranging an interesting list of papers. The authors who will contribute to this session will be: A. V. DeForest, American Chain Co., Bridgeport, Conn.; A. L. Davis, Scovill Mfg. Co., Waterbury, Conn.; H. M. German, Henry Disston & Sons Co., Philadelphia. The hardness testing committee of the National Research Council also plans to have for examination and discussion a hardness testing machine from England.

The demand for exhibition space has been so heavy that it is necessary to use both the main floor of the Motor Square Garden and also the sub-floor. Located on the sub-floor is the meeting room, at which round tables and symposiums of the program will be held, while there will also be located on this floor an exact replica of King Tut and his tomb. The management of the exposition has, at considerable extra expense, given the meeting-room floor an entire Egyptian setting and the replica of King Tut and his last home is carrying out the general scheme of decoration. Besides the oriental music, decorations and the usual equipment that accompanies an Egyptian scene, many of the exhibits located on this floor are to be in operation.

School for Trade Association Secretaries

Retail and wholesale distribution will be a subject for special discussion at the coming session at Northwestern University, Aug. 19 to Sept. 1, of the National School for Commercial and Trade Executives. This course will be directed by Alvin E. Dodd, manager of the domestic distribution department of the Chamber of Commerce of the United States.

Commercial organization and trade association secretaries are expected to attend. Some of the courses to be given are psychology, economics, business and government, marketing and distribution, public speaking, journalism, salesmanship, industrial promotion and transportation.

Ways and means of accurately surveying the wholesale and retail purchasing power and capacity of a town or city will be one of the topics. This will be considered from the standpoint of the individual consumer and that of the commodity.

In preparation for this course the distribution department of the National Chamber, under the direction of Mr. Dodd, has compiled a large amount of data as to the feasibility of such a statistical compilation. One moderate size city has been surveyed and the results will be announced for the first time through these studies.

In another suit filed by the Allied Chemical & Dye Corporation in the Circuit Court at Chicago it is sought to enjoin the distribution to stockholders of the proceeds from the sale of the Steel & Tube Co. of America to the Youngstown Sheet & Tube Co. It is charged that the terms of the sale favored certain majority stockholders and that a banking firm in New York had a large influence in the business through directors selected by them.

WORLD POWER CONFERENCE

To Be Held in London in July, 1924—Ambitious Program Detailed

Next summer the British Empire Exhibition is to be held at Wembley, London. In July, by permission of the executive council of the exhibition, there is to be held in connection therewith a World Power Conference, initiated by the British Electrical and Allied Manufacturers' Association, Inc., but participated in by many technical and scientific institutions and industrial organizations in Great Britain and other countries.

It is the purpose of the World Power Conference to consider how the industrial and scientific sources of power may be adjusted nationally and internationally.

By considering the potential resources of each country in hydro-electric power, oil and minerals.

By comparing experiences in the development of scientific agriculture, irrigation and transportation by land, water and air.

By conferences of civil, electrical, mechanical, marine and mining engineers, technical experts and authorities on scientific and industrial research.

By consultations of the consumers of power and the manufacturers of the instruments of production.

By conferences on technical education, to review the educational methods in different countries, and to consider means by which existing facilities may be improved.

By discussions on the financial and economic aspects of industry, nationally and internationally.

By conferences on the possibility of establishing a permanent world bureau for the collection of data, the preparation of inventories of the world's resources and the exchange of industrial and scientific information through appointed representatives in the various countries.

The importance with which the conference is regarded in Great Britain is evidenced by the eminent engineers, scientists, industrialists and financiers connected with its organization and management. The president is the Earl of Derby.

American Participation

In response to invitations for American participation twenty-odd American engineering technical and industrial organizations have appointed representatives to a committee of arrangements which has planned the following organization:

Honorary Chairman: Hon. John W. Weeks, Secretary of War and Chairman of the Federal Power Commission; *Honorary Vice-Chairmen:* Hon. Hubert Work, Secretary of the Interior; Hon. H. C. Wallace, Secretary of Agriculture; Hon. Herbert Hoover, Secretary of Commerce; Gen. Guy E. Tripp, chairman Westinghouse Electric & Mfg. Co.; Owen D. Young, chairman General Electric Co.; Samuel Insull, president Commonwealth Edison Co., Chicago; Prof. L. P. Breckenridge, chairman United States Superpower Survey and Sydney Z. Mitchell; *General Chairman*: O. C. Merrill, executive secretary Federal Power Commission; *Vice-Chairman*: H. J. Pierce, president Washington Irrigation & Development Co., representing American Electro-Chemical Society and National Electric Light Association; *Secretary*: W. M. Steuart, Bureau of the Census, Washington; *Treasurer*: H. M. Addinsell, Harris Forbes & Co., New York; *Executive Committee*: William M. Steuart, Bureau of the Census; Col. Peter Junkersfeld, consulting engineer, New York, representing American Electro-Chemical Society, American Institute of Mining and Metallurgical Engineers and American Society of Mechanical Engineers; Calvert Townley, Westinghouse Electric & Mfg. Co., representing Federated American Engineering Societies, and American Institute of Electrical Engineers; H. M. Addinsell, Harris, Forbes & Co., New York, H. I. Harriman, president New England Power Co., representing United States Chamber of Commerce; Fred R. Low, editor of *Power*, McGraw-Hill Co., New York, representing American Society of Mechanical Engineers and Federated American Engineering Societies; John W. Lieb, New York Edison Co., representing American Institute of Electrical Engineers and Association of Edison Illuminating Companies.

Working committees have been appointed and General Chairman Merrill is now in London gathering information as to the scope and details of the expected American participation. Invitations will be extended to other organizations who may be interested and it is the purpose and hope to make a contribution to this first effort toward a systematic study of the world's power resources and their utilization commensurate with the part that America has played in the development of this "age of power."

BRITISH FOREIGN TRADE

Sharp Decline in June Steel Exports—Imports Show Little Change

Exports of iron and steel from Great Britain in June recorded a sharp decline from May, the year's maximum thus far. At 373,277 gross tons, the June export total was the fourth largest this year, and compares with 435,630 tons in May.

Imports in June were 130,066 tons, or close to the average for the previous five months. They were the third largest this year, the greatest volume having been in May, at 133,929 tons.

Comparative data for both exports and imports, scrap being included, are as follows:

British Steel Exports and Imports, Gross Tons

	Exports	Imports
Aver. per month, first quarter, 1923	358,208	128,032
April, 1923	398,507	133,929
May, 1923	435,630	114,132
June, 1923	373,277	130,066
Aver. per month, second quarter, 1923	402,471	126,042
Average per month, 1922	295,980	82,215
Average per month, 1921	144,885	152,734
Average per month, 1920	274,881	128,685
Average per month, 1919	188,519	50,801
Average per month, 1913	420,757	195,264

More detailed data of the exports are as follows:

Principal British Exports, Gross Tons per Month

	1913	1922	June 1922	June 1923
Pig iron } Ferroalloys }	93,700	66,159	43,402 12,603	35,639 20,881
Steel rails	42,200	21,300	10,928	23,547
Steel plates	11,200	6,700	3,745	23,848
Galvanized sheets	63,500	43,600	35,432	47,756
Steel bars, rods, etc	20,900	19,100	15,961	32,199
Tin plates	41,200	37,400	37,134	50,281
Black plates and sheets	11,700	18,700	18,964	32,561

Data as to importations of importance are as follows in tons per month:

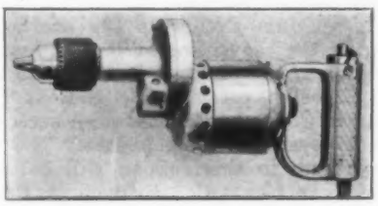
	1913	1922	Jan.-June 1923
Iron ore	620,000	289,400	551,125
Manganese ore	50,100	28,109	40,346
Pig iron and ferroalloys	18,000	12,800	11,432

Exports of scrap iron and steel in June were 8129 tons, or 11,066 tons per month for the first six months of this year, as compared with 12,880 tons per month in 1922. In 1913 there were 9600 tons per month.

Light Weight Electric Drill

A portable electric drill, weighing but 5½ lb., and having a drilling capacity up to ⅜ in. diameter in steel, has been placed on the market by the Jones Drill & Specialty Corporation, 245 Seventh Avenue, New York.

The machine will operate on either alternating or direct current. The standard tool is for 110 volts, but



Portable Electric Drill Having Capacity Up to ⅜ In. Light weight is a feature.

the machine equipped for 32 or 220 volts is available also. The size is 11 in., overall. A Jacobs 2A chuck is used, and equipment may be provided to convert the tool into a portable or stationary grinder, buffer, polisher, valve grinder or electric screw-driver. An automatic drill press of ⅜-in. capacity, arranged with automatic starting and stopping of the motor so that current is being used only when actually drilling, is also available.

Progress Shown in Soaking Pit Design

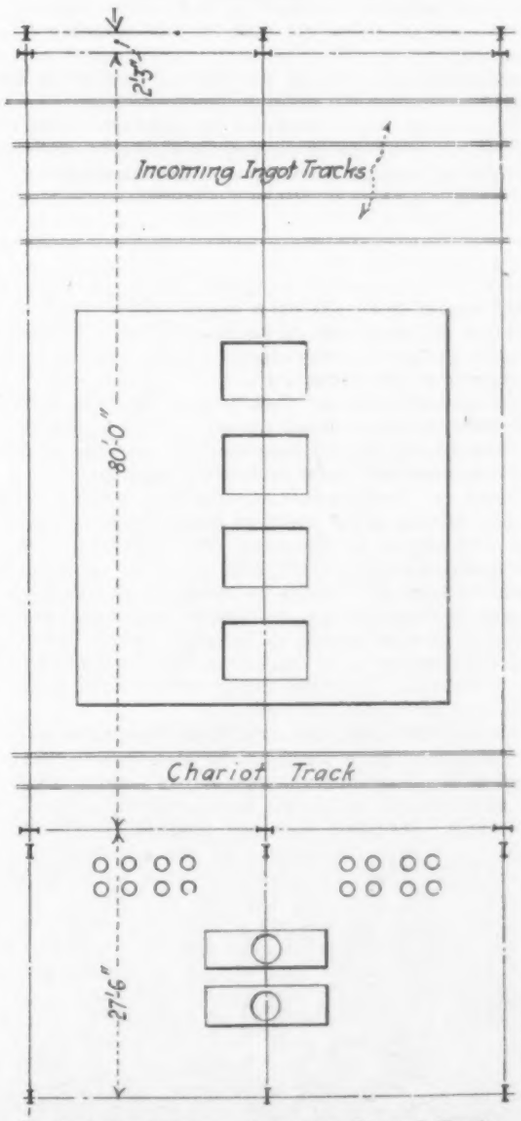
Both Arrangement of Holes and Design of Reversing Mechanism Made to Yield Results—Ingots Handled More Rapidly

A NEW soaking pit plant is being built at the Wisconsin Steel Works, South Chicago, of the International Harvester Co. that differs materially in design and arrangement from the usual practice in soaking pit construction. The company has embodied new and interesting features and has avoided other features, ordinarily found in soaking pits, that it regards as unsatisfactory.

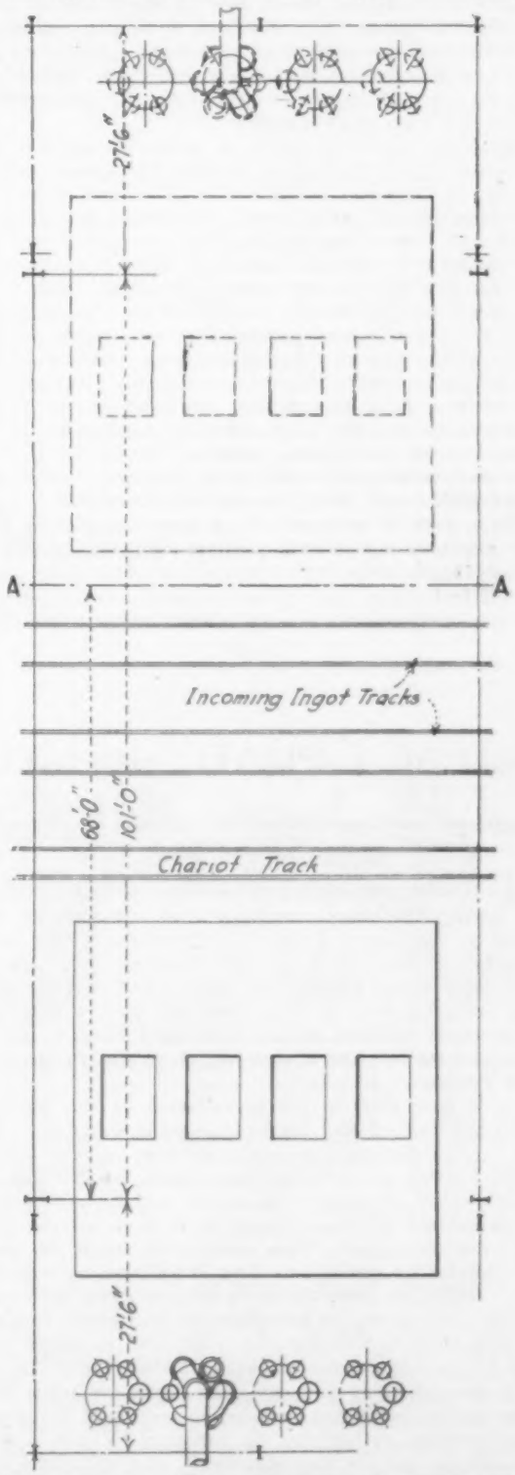
While great progress has been made in the development of the open-hearth furnace, steel plant engineers having centered their attention on open-hearth construction, soaking pit construction and operation have remained virtually the same as twenty years ago. That little or no advance has been made here is attributed to the fact that soaking pits were standardized years ago and the standard design has been generally followed without much attention being given to the improvement of their construction.

Another reason for the absence of progress in this field is that soaking pits are usually under charge of the blooming mill superintendent, who has so many other duties that he is unable to give them the attention they deserve. The operation of open-hearth furnaces, on the other hand, is under a superintendent who devotes all of his attention to them. In view of the fact that the output of many blooming mills is limited by the capacity to heat the steel properly, many steel plant engineers now maintain that the soaking pit deserves more consideration.

An objection to the usual soaking pit arrangement,



Typical Arrangement of Soaking Pit and Tracks



New Arrangement of Soaking Pit and Tracks, with Portion Above *AA* Showing Additional Pit on Other Side of Tracks. This arrangement, whether single or double, makes important improvements in several particulars

shown in Fig. 1, with the incoming ingot track on one side of the pit and the chariot track on the opposite side, is that it is necessary to carry the ingots both over the covers of the adjacent pits and over the mechanism for operating the covers, or to carry the ingots around the pits, which not only increases the time of operation but also greatly increases the travel and, consequently, the wear on the crane. Another main objection to the usual arrangement is that it necessitates the use of sixteen individual regulating valves located in the flues underground for controlling the air and gas in a four-hole pit.

When the reversing valves of a pit reverse, also, it is not customary to reset them; consequently the passages to the stack are contracted to the same size as are each of the incoming passages. Therefore, because the outgoing gases are so much hotter than the ingoing gases, the holes are in reality regulated by regulating the outgoing and not the ingoing gases. It is also pointed out that the use of these regulating valves adds greatly to the cost of the pit and complicates the design of the furnace.

Realizing the importance of these objections, the Wisconsin Steel Works has adopted the design shown in Fig. 2. The chariot track for the ingot going to the blooming mill and the two incoming ingot tracks are on the same side of the pits and the holes are parallel to the tracks. These are said to be the first soaking pits with modern type valves to be built with the holes parallel to the tracks. With this arrangement the ingot can be carried from any place on the tracks to the pits by the shortest route, without crossing any intervening hole or passing over any of the machinery. With this design the span of the crane is shortened and the elimination of regulating valves permits a decrease in the width of the building. The simplified construction and the decreased space required tend to cut down the construction costs.

Each hole is reversed by a separate McKee six-way regenerating reversing valve designed by Willis McKee, Cleveland, and described in THE IRON AGE June 7 last. The four valves required to reverse one pit are operated by one reversing mechanism. The tubes of these valves are lined with insulating brick so as to reduce the heat lost to a minimum. The motor and reversing mechanism for these valves are placed under the platform and raise, reverse and lower the four valves in the same way as the individual McKee valve previously described.

Each hole in each pit has its separate valve and each valve has its own gas-regulating and shut-off valve and two air-regulating stands. The valve is so designed that the regulation of the incoming air in each end of each hole is separate from that of the opposite end and does not contract the outlets; consequently a clear passage to the stack can always be obtained. The raising of the valve is accomplished by the cam on the operating rig and the toggle joint over each individual valve. The reversing is accomplished by the racks, which are in series. A separate stack damper is provided for each hole, and each valve has its separate lever for regulating the incoming gas; these levers are so interlocked that they must be shut off before the valves can be reversed.

This design when used in connection with a mill of large capacity can be modified by building two rows of pits, one on each side of the tracks. It is stated that these will decrease the travel of the chariot approximately 50 per cent, and will make it possible to get the ingot to the mill much quicker. With this design of pit it is possible to install any number of holes desired or for which space is available, while with most pits it is necessary to build the holes in units of four each.

To sum up, the advantages claimed for this type of pit include simplicity in design, decreased requirements in building space, shorter crane span and easier service on the crane, more rapid handling of ingots, elimination of individual control of the valves, elimination of the contraction of the path of the outgoing gases, doing away with all valve parts underground and the practicability of building any desired number of holes instead of having the holes in blocks of four.

These pits were designed by William Forrstrom, chief engineer of the Wisconsin Steel Works, under the direction of George Rose, general superintendent.

HELPING EMPLOYEES TO SAVE

Campaign of Cooperation in Cleveland Between Industries and Bank

An intensive campaign to develop the habit of saving among individual workers was inaugurated recently by the Union Trust Co., Cleveland. "The save at the shop plan," as it is called, does not differ materially from plans having the same object in view that have been followed by other banking institutions, but the methods adopted by the Cleveland bank to make the plan a success and to simplify its operation are said to be original.

As a first step in the installation of the plan, a representative of the bank thoroughly explains the plan to the foreman or superintendent of the plant. About a week prior to the installation of the plan a letter written on factory stationery and signed by one of the officers of the company is sent to all the employees of the plant. This outlines in detail the plan and explains its operation. This is followed by a letter to the employees from the bank written upon bank stationery and signed by an officer of the bank, further outlining and explaining the plan and pointing out some of the advantages of saving money regularly.

On the following pay day bank signature cards and authorization cards are inclosed in each pay envelope, the latter card authorizing the company to open a savings account for the man signing it, and indicating the amount which he wishes deducted from his pay and deposited for him each week. Little additional bookkeeping is required at the plant. Deposit slips with carbon sheets and receipts padded alternately are furnished by the bank. When a deposit slip is made a receipt for the employee is made out at the same time and the paymaster uses these in making the proper deductions in the payroll.

The deposit slips are then sent to the bank together with the company's check for an amount equivalent to the total of the deposit slips and the amounts on these slips are credited to the individual employee.

Later the bank makes a thorough canvass of the plant in an attempt to enroll as many employees as possible and secure on the spot their signatures to the authorization cards. The solicitation for membership in an intensive advertising campaign is continued with the use of shop posters, newspaper and street car advertising and billboards. The plan, which was first tried experimentally in one plant, has been adopted by over a hundred Cleveland plants and several thousand depositors have been secured.

Evidence obtained from the bank from executives of companies that have taken up the plan indicate that its adoption has proved a valuable aid in solving some of the problems of industrial management, particularly the matter of labor turnover and efficiency. It is pointed out that the morale of the workmen is improved when they are taught to save some of their earnings. The plan has supplied an objective which has transferred men who are drifters into steady workers who start saving with some definite object in view. It is found that some save simply to accumulate the money but the majority pick out a definite object which they desire to possess, such as an automobile, or a new home. One Cleveland plant executive stated that this industrial saving plan has demonstrated its value in his plant by stimulating attendance, punctuality, and reducing the borrowing habit among employees.

Combination Grinder and Buffer

A combination grinding and buffing machine with incased spindle construction and adapted for a variety of work requiring the use of grinding, buff, wire-brush or rotary-wire rasp wheels has been placed on the market by the Hisey-Wolf Machine Co., Cincinnati. The general design is new but in construction details the machine is similar to the company standard ball-bearing grinders and buffers.

The machine is made in 1 hp. size for alternating and direct current, the motor being direct connected as

Direct Motor-Driven Combination Buffing and Grinding Machine. The spindle extension is a separate unit connected to motor armature shaft by clutch

shown. The spindle extension is a separate unit and is connected to the motor armature shaft by a suitable clutch. Each shaft unit is supported by two ball bearings, a construction intended to make for rigidity. The standard a.c. machine is equipped with 60 cycle, single and three-phase motors running at 3500 r.p.m. at no load. Motors for 40 cycle and 25 cycle, running at 2400 r.p.m. and 1500 r.p.m. at 2/3 and ½ hp. respectively, are also available. Single phase machines are for operation from a lamp socket or lighting circuit line wires. Two or three-phase machines are for operation on corresponding power circuit lines only.

The direct current machines are regularly available for voltages of 115 and 230 volts, but may be furnished for special voltages from 80 to 250. The d.c. machines run at 3200 r.p.m. at no load.

Grinding and buffing wheels 8 x 1½ in., with ¾ in. hole, are used. A base for bench mounting is available. Connector cable, switch, wheel guard and grinding wheel are part of the standard equipment. Wire-brush wheel, buff or rotary rasp wheel are extras. The weight of the machine is 390 lb. net.

Invar and Other Nickel Steels

A recently revised circular issued by the U. S. Bureau of Standards, entitled "Invar and Related Nickel Steels," furnishes information on the properties of nickel steels of relatively high nickel content.

Particular attention is paid to Invar, nickel-iron alloy containing about 36 per cent of nickel and possessing an extremely small degree of thermal expansivity; and to Elinvar, a recently developed alloy containing 36 per cent of nickel and 12 per cent of chromium or its equivalent. The latter possesses an invariable modulus of elasticity as well as a low thermal expansivity. These alloys are used largely in cases where nonvariance of dimensions and elastic properties is required between the limits of temperatures ordinarily encountered (32 to 100 deg. Fahr.). They are used for measuring tapes in accurate surveying, standards of length measurement, various parts of precise measuring instruments, parts of watches, clocks, chronometers, etc.

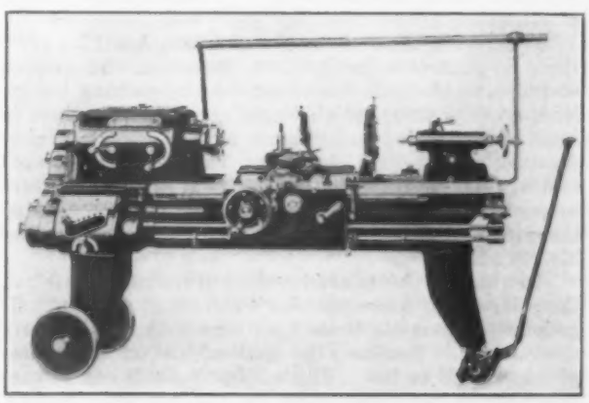
Nickel steels of different nickel content are used for a variety of purposes, such as gun tubes and other guns parts, pneumatic hammers and air drills, certain parts of gas engines, automobiles, airplanes, and other machines subject to severe stresses, boiler tubes, valves in sea water pumps, thermostats, rheostats, electric heaters, etc. Nickel steels of high nickel content possess the property of being highly resistant to corrosion by fresh water, sea water, and acid liquors. The circular gives considerable attention to the peculiar properties which permit these steels to be used for the purposes indicated.

These steels are described in Circular No. 58, Second Edition, of the Bureau of Standards, entitled "Invar and Related Nickel Steels." Copies of this circular may be obtained from the superintendent of documents, Government Printing Office, Washington. The price is 30c.

Portable Geared-Head Lathe

A Sundstrand 15-in. portable geared-head lathe for use in railroad shops and shipyards, and patterned after its 14-in. tool room machine, has been placed on the market by the Rockford Tool Co., Rockford, Ill. When motor driven the motor is mounted on the headstock, instead of on a bracket attached to the rear of the machine as in the standard tool room lathe.

Combining power and rigidity with symmetrical design has been the aim, convenience of control having been given careful attention also. The construction of the bed, headstock, spindle, carriage, apron and other members of the machine follows closely the 14-in. tool room machine. The swing is 15-in. over the bed and 8¾-in. over the carriage, the distance between centers, 6-ft. bed and tailstock flush with the end of the bed, being 32 in. Feeds from 6 to 368 per in. are available. Threads from 1½ to 92, including 11½ per in. may be cut. There are 12 spindle speeds and speed changes



Portable Geared-Head Lathe. When motor-driven, the motor is mounted on the headstock

can be made with the machine in operation. The drive pulley is 10 x 3¼ in. and runs at 350 r.p.m. The weight of the machine with 6-ft. bed is approximately 2250 lb.

Another Use of Sheet Steel Promised

The trench hat, the "old tin hat" that served in some measure to turn shrapnel hail on the war-swept fields of France, is coming into quite extensive use as a means of head protection against falls of rocks and ore in the mines of California, West Virginia, Oklahoma and many other States, according to R. V. Ageton, metal-mining engineer of the Bureau of Mines, Department of the Interior. The hats are being used in shaft sinking and in raising operations and around and in hoisting shafts, states Mr. Ageton. The "trench shoe" and similar heavy shoes are also being utilized by miners as a medium of foot protection.

PEARLITIC CAST IRON*

New Type of Iron Castings Developed in Germany—Use of Hot Sand Molds Affects Microstructure and Properties

The introduction of a new name for castings made under special conditions is always regrettable, and it is a question whether it was necessary to make the designation given by the title of this article to cover the product of a peculiar departure in the preparation of molds and selection of analysis for the castings in question. Since, however, these "pearlitic" castings are beginning to be extensively advertised in Europe, the matter will be of interest here.

The microscope in the iron foundry, while an excellent laboratory aid, has not proved to be of special value in the shop itself. This is natural enough, as once the castings have been made the microstructure is fixed, and only in very special and isolated cases will heat treatment be given the castings to change this condition—as, for instance, in the newly introduced centrifugally cast iron pipe made in steel molds. It seems, however, that these "pearlitic" castings do show a dominant microstructure which is pearlitic in character, whereas the ordinary run of work has much less of this component in its make-up.

Ordinary gray iron castings, considered microscopically, consist of varying proportions of graphite, ferrite, pearlite and free cementite—with some phosphide eutectic, iron sulphide and manganese sulphide, depending upon the sulphur content. The ferritic part of the metal is soft and weak, and the flakes of graphite that are present accentuate this fault. Cementite is a very hard and brittle iron carbide which is unstable and tends to split into its components, ferrite and temper carbon. By comparison with steel of 0.90 per cent carbon content which when annealed consists of pearlite only, and is strong and of excellent quality, a cast iron of pearlitic structure, even with the unavoidable graphite, must be of special value as a consequence of this situation.

In a recent issue of *Stahl und Eisen*, April 26, 1923, there is an article by Prof. O. Bauer on the subject, which states that this iron is obtained by pouring molten iron, a composition which would give white castings in sand, into highly heated sand molds, and thus gray fracture castings are obtained. The structure of such castings is pearlitic with the usual graphite plates interspersed. The trials were made in 1916, during the war, and the process is covered by German patent No. 301,913.

Two salient points are involved in the method. First, the selection of a composition which shall give as little graphite as possible if the iron were cast into ordinary sand molds. Further, the carbon, silicon and phosphorus should be low. The sulphur content can be considerable without detriment to the process. Second, the mold must be pre-heated to a point such that the setting of the iron is retarded long enough to allow the separating out of graphite in spite of the low silicon. If these two points of composition and mold temperature are balanced to a nicety, the results are very excellent.

A series of test bars was made from three kinds of cast iron. First, from an ordinary stove plate mixture; then from cylinder iron, and finally from the special mixture intended for this pearlitic cast iron. The analyses will be of interest as showing the differences in composition:

Variety	Total Carb., Per Cent	Comb. Carb., Per Cent	Silicon, Per Cent	Manganese, Per Cent	Phosphorus, Per Cent	Sulphur, Per Cent
Stove plate	3.29	0.30	2.79	0.56	1.15	0.084
Cylinder iron	3.51	0.67	1.74	0.66	0.50	0.076
Pearlitic iron	3.25	0.84	1.11	0.79	0.40	0.154

The microstructure of these irons shows the following: The stove plate iron contained graphite, ferrite and pearlite, with considerable phosphide eutectic. The cylinder iron showed more pearlite with less ferrite, some phosphide eutectic and coarse graphite flakes. The pearlitic iron consists of pearlite with fine graphite plates and no ferrite. As might have been expected, the transverse tests showed the highest strengths for the pearlitic iron, with the cylinder iron second and the stove plate last; similarly, for the tensile results. The Brinell tests, while running the same way, nevertheless exhibit but slight differences, showing that machinability has not been hurt by the heavy reduction in the silicon—as the combined carbon remained low.

*Abstracted and discussed by Dr. Richard Moldenke.

Advantages of Heating Molds

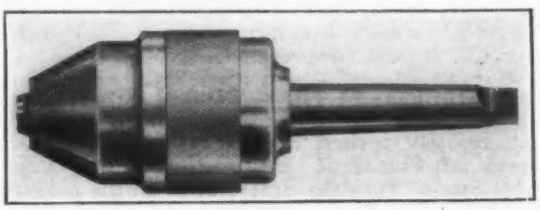
There must naturally be some obvious advantages obtained to offset the cost of heating the molds specially, apart from the better structure obtained. The comparatively longer cooling period, as the metal sets more slowly than ordinarily, must practically remove all the casting strains. Much is claimed for better wearing and higher resistance to the effect of blows. It is further claimed that the peculiar pearlitic structure can be checked up readily by the microscope as a matter of daily routine in the shop, which would make it about the first instance that this instrument can be used outside of the laboratory in an iron foundry.

In conclusion, the new departure is interesting from the following standpoint: In ordinary green-sand molding the rate of cooling of the molten metal is a little faster than when the molds are of dry sand. When a steel mold is used, the rate is very much faster even if the mold be hot. Now, with this new method of casting, the sand molds are not only dried but they are made very hot, and here is a case of a long retardation of the setting and cooling period. Perhaps it is the setting period that is most important, as graphitic castings are wanted from irons that would give white fractures ordinarily. The case is, therefore, different from the pouring of hand brake-wheels in the malleable foundry and removing them quickly after setting to highly heated furnaces to cool down slowly to prevent cracking. Here white iron is wanted and not gray; and the method is used to ease off the casting strains.

Quick-Change Drill Chuck

The drill chuck shown in the accompanying illustration, which is known as the Neudick automatic quick-change chuck, is being marketed by the MP Trading Co., Inc., Fifteenth and Mount Vernon Streets, Philadelphia. Quick changing of drills, simplicity of design, and durability are features emphasized. The chuck is for straight-shank drills and is available in three sizes with a drill range from 1/48 to 25/32.

Drills may be changed with the spindle running, and the chuck is said to have a firm grip which increases automatically as the drilling resistance increases. The release is claimed to operate so easily that the chuck



Drill Chuck with Quick Change Feature. Drills may be changed with machine spindle running

may be used on high-speed machines without danger of burning one's fingers when changing drills while the machine is in operation. A slight grip with the thumb and forefinger on the collar will open the chuck; releasing the collar instantly closes the chuck. Among the features of design are smooth cone-shaped roller jaws intended to hold and center the drill true and eliminate spoilage or breakage of drills. No bushings or collets, wrenches or keys are required in the operation of the chuck.

Designing and Making of Wire Springs

Operations of Coiling and Grinding—Proper Relative Dimensions of Coils—Character of Wire Best Suited for Springs

BY J. H. SULLIVAN*

WIRE springs are used to such a great extent, and the safe action and the load a spring can be built to appears to be known to so few outside the spring manufacturers, that some information as to the limits of the material and the labor required to make safe and uniform springs, with very little variation in diameter, height or load test, may prove interesting and of value to machine designers and engineers.

Automobile valve springs have to stand about as severe tests as any spring should be given. The fact that they are doing the work required of them, sometimes for years without sagging or breaking, proves that springs are very reliable when properly designed and manufactured.

Coiling the Spring

The first operation is coiling the spring. The automatic coiling machines feed in a predetermined amount of wire, close the end coils and cut the wire while the feed rolls are at rest. When the cutter recedes, the feed rolls again feed in wire. The pitch control is timed to spread the coils to the desired pitch, after the closed end coil is formed, and to recede in time to have the last coil formed without pitch. The rolls now stop feeding, when the cutter advances and severs the wire. This can be done at a speed of forty-five springs per minute, if there is not more than 4 ft. of wire in the spring. Springs requiring a greater amount of wire require more time to make.

An experienced spring maker can detect any slight change in diameter or height of spring and has means of controlling height and diameter while the machine is running. But as it is impossible for him to measure the springs as fast as they are made, where springs have to meet an exacting test, the springs are put on a mandrel of the diameter required and set to exact height before the springs are heat treated.

Coiling a spring stretches the molecules on the outside and compresses them on the inside. The smaller the diameter of spring, the more the wire is injured. But by heat treating, the molecules get back into place again, and the proof of this is shown by the heat treated spring being from 20 to 25 per cent better for lasting qualities than the untreated spring, and less subject to fatigue.

Grinding the Ends of Springs

The next operation is grinding the ends of the springs. As these springs have all been set to a uniform height and heat treated, both ends of the spring can be ground at the same time. Adjustment for keeping the emery wheels a proper distance apart, to compensate for wear of wheels, is provided. The springs are then compressed solid, with at least 100 per cent overload, and after two solid compressions all permanent set should be removed from the spring. A certain proportion of the order are now tested, and the plus or minus allowance marked on the dial of the testing machine. The balance of the order can be tested rapidly and there will be very few rejections if we are allowed 10 per cent plus or minus on the load required.

Small orders for springs are sometimes made by machinists on a mandrel, but they cannot get so nearly uniform results as when springs are made on spring coiling machines. If the wire should vary in hardness, it will show in a difference in the diameter, also in the pitch of the spring. Another reason for not obtaining uniform results is that the machinist cannot control the wire on a lathe so well as it is controlled by a spring coiling machine. To make uniform springs for the right price requires as much skill, practice and ingenuity as is called for by any other line of endeavor.

Proper Dimensions for a Valve Spring

The outside diameter should be not less than nine times the size of the wire from which the spring is made. The height of the spring should be not more than three times the outside diameter and the pitch or lead of spring not more than twice the diameter of the wire; that is, the space between the coils should be not more than the size of the wire from which it is made. Some engineers use even a greater factor of safety than this will give, but the majority call for springs designed to a higher fiber stress.

Almost every spring manufacturer has tables or slide rules, or both, that enable him to design springs rapidly and at little cost. Many automobiles have valve springs designed to a higher fiber stress apparently giving good service, but for safety and comfort the dimensions above should not be exceeded. The dimensions stated will make a satisfactory valve spring for any size engine. The finer the wire, the greater factor of safety there will be. In the finer sizes of wire, a spring so designed would not be strained over one-fourth of the capacity it could be built to, and would give long and satisfactory service.

Agricultural machinery compression springs are usually designed to the limit of material, as they are not used constantly and they seem to be doing satisfactory work, as they are not frequently replaced. When designed to the limits of the material, there is less weight to the spring, which of course helps to keep the spring cost down, but the method of manufacture is entirely different. The springs are coiled as much as 20 per cent higher than the spring is required to stand after solid compression. A bending strain comes when these springs are compressed solid, and they do not return to the original free height, but allowance is made for this and the springs come up to the height required. The plus or minus limits are usually much greater, if they are stated at all, than on valve springs. Consequently, as there will be hardly any rejections and no cost for testing, the selling price is much lower per pound than on valve springs.

Extension springs, while made from the same material as a compression spring, will not give the same action as a compression spring and, while it is possible to have it carry the same load, the action will be only about two-thirds of what can be had from a compression spring, as about one-third of the total load carried by the extension spring is tied up in initial tension. To explain, a spring of a capacity of 400 lb. would show an action of 1 in. for the first 200 lb., and then an action of 1 in. for the next 100 lb. and 1 in. for the third 100 lb.—3 in. action in all for 400 lb. Extension springs, if loaded beyond the elastic limit, will not go back coil to coil. This does not mean that the spring is worthless. It is still good for a load within the elastic limits, but the action will be greater. Once the initial tension is removed by strain or heat treatment, it will then give an action proportionate to the load applied. Compression springs are usually confined in a hole or used on a rod, and can stand considerable overload without a permanent injury.

*Superintendent, Superior Spring Co., Springfield, O.

Extension springs are not so safeguarded and are much more liable to be strained.

Character of Wire Used

Piano or music wire is the best grade of wire for springs. It is a crucible steel carefully melted, handled carefully all through the different operations necessary to get to size. It has considerably more work done on it than is done on the regular spring wire, hence it is of a much higher tensile strength and springs can be built to a higher fiber stress than with the ordinary open-hearth steel. It is rarely used in sizes larger than ⅛ in., but is used almost exclusively in the finer sizes—0.008 in. to 0.080 in. It is drawn more accurately to size and the wire is finely finished and polished after it has been drawn. Springs made from piano wire are seldom ordered blued, but they would be benefited even more than the ordinary wire if blued.

There is also a grade of wire that is oil tempered before being coiled into springs. The manner of tempering oil-tempered wire is somewhat similar to the treatment given the wire before being made into the premier grade. The wire is heated to a tempering heat, cooled in running oil. Temper is then drawn in lead and the wire is wound on split sheaves about 100 ft. distant from the lead furnace. This length of travel is required to give the wire a chance to cool before being wound on the split sheaves. This wire will show a higher tensile strength than ordinary spring wire, but not so high as the music wire. It is less liable to fatigue than premier wire, but springs made from this wire, built to a safe fiber stress of spring wire, will show no better results than the regular spring wire. It can be built to a greater pitch than premier wire, and in some cases it is the only wire that will meet the test.

Springs that are hardened in oil after being coiled can be built to meet any test that springs made from oil-tempered wire will give, that is, in the compression line. But they are hard to get perfectly straight for, when they are of a tempering heat and if not hardened in oil perfectly straight, they will become more or less crooked. One can nearly always tell a hardened spring from one made any other way, as it cannot be lined up perfectly straight unless the diameter of the spring is fully one-third the height of the spring. To oil temper an extension spring after it is coiled would remove all the initial tension from it, making it inferior to the ordinary wire for any purpose other than a scale or governor spring.

Kind of Section Required

Round steel is the best of all materials to use for springs. The work which can be stored up in a spiral spring is simply proportionate to the weight or quantity of material in it and we can store more energy in a spring formed from round wire than in one of equal weight of same material whose wire has any other than a circular section. While square wire will carry a greater load, it has considerably less action and is more liable to crack than round steel.

Flat wire springs are used when the requirements cannot be met with round wire, but as this wire has to be made flat after it is drawn round, the steel is more or less injured by rolling wire flat and it is usually done cold, except in the heavier sizes varying from 3/16 in. to ½ in., which seems to be harder on the material than drawing round wire through a die. Then if this wire has to be wound on edge it has to be stretched too much on the outer edge and is compressed considerably on the inner edge; so much so, that the coils cannot be closed solid at the outer edge of spring and heat treatment, while it benefits the wire, does not get it back to its original size.

Special Steels, Properly Handled, Are Costly

Vanadium steel has proved its superiority over carbon steel only when it has been given the proper heat treatment and extreme care used in the manufacturing by the steel maker, the wire mill and the spring maker. If there is any mistreatment of this steel by any one it appears to suffer more than the ordinary carbon steel. Open-hearth chrome vanadium spring steel may be better than plain carbon steel, if right treatment is given it at every point. As crucible steel is better than open-hearth steel, so the genuine chrome vanadium steel, when properly melted and properly treated at every point, will give best results and, while some engineers will call for springs made from this material, they are not willing usually to pay the price necessary to give the material the work required on it to get the best results.

Many people order high-priced steel and get no better results from it than could be had from carbon steel ordinarily handled. It has been stated time and again by experienced steel makers that the best steel, the most reliable under all circumstances, is that which comes nearest to pure iron and carbon. That is to say, such a steel, if overheated, overworked or subjected to any of the irregularities inevitable in shop practice, will suffer less harm than steel of equal initial strength which has less carbon and the additional strength is given by other substances. From this it seems it is only necessary to use a higher factor of safety for carbon steel, to obtain the same results as can be had from high-priced alloy steels and at a much lower cost. As the ordinary carbon steel wire can be designed to give years of satisfactory service as a valve spring, why change it?

Educating Employees in Industrial Economics

A strong plea for the education of industrial employees in the fundamentals of business economics and in the details of the businesses in which they are employed is made by Carl F. Dietz, president Bridgeport Brass Co., in a pamphlet recently issued by the fabricated production department of the Chamber of Commerce of the United States.

The methods employed by Mr. Dietz's company are unique. Employees are educated through lectures and by means of simple visual illustrations. In the place of charts and graphs blocks of colored wood are used.

Workers who perform certain operations on materials before they have reached an advanced stage toward completion often show little interest in their work because they never see the start and finish of the job on which they are employed. There is manifest at all times, declares Mr. Dietz, a real desire on the worker's part to know more about the business in which he is employed. Far-seeing managers, he adds, are seeking the best methods of imparting such information constructively, especially information regarding the relation of production to wages and the distribution of the dollar received for the product of the plant.

One real benefit to be found in this, Mr. Dietz points out, is that it is of great effectiveness in counteracting misinformation and propaganda. Copies of the booklet may be obtained by addressing the Chamber of Commerce of the United States, Washington.

American Puddled Iron Co.

Operation of the mechanical puddling plant at Warren, Ohio, by the American Puddled Iron Co., formed by Youngstown, Ohio, interests, is expected about Oct. 1. The mechanical puddling process to be employed in the new plant has been so far developed, it is claimed, that the need for hand puddlers will rapidly diminish. Among the largest puddling plants in the Middle West are those of the A. M. Byers Co., Pittsburgh, at Girard, Ohio, and the Youngstown Sheet & Tube Co., at East Youngstown. The Byers plant has 88 furnaces and the Sheet & Tube plant 50 single furnaces. When operating at capacity, these mills employ fully 500 puddlers and helpers. Within recent years it has become increasingly difficult adequately to man such plants because of the scarcity of puddlers.

At a special meeting recently stockholders of the Youngstown Steel Co. approved the sale of the Warren plant and the business to the American Puddled Iron Co., a new corporation with $3,500,000 capital, which will operate the property. E. L. Ford is the leading figure in the organization.

Piston Rods for Steam Drop-Hammers

Causes of Some Defective Rods—Specifications for Material Suitable for Best Service—Heat Treatment a Factor

BY A. A. BLUE*

THE value of a serviceable piston rod in the modern high-speed steam drop-hammer is of the highest importance in view of the considerable value of the rod itself, the overhead rate of the hammer, the loss in production due to shutdowns, the cost of removing the old rod and putting in a new one, etc. In spite of this great importance it is not uncommon to find these parts in such condition as to reflect careless methods in their manufacture. The following comments presuppose that the hammer has been lined up true and that, especially in cold weather, any chill has been removed from the rod.

*Technical manager, Duff Mfg. Co., Pittsburgh.

Defects and Their Causes

The nature of the service of drop-hammer rods is very severe as, unlike those of the ordinary forging hammer, these rods receive for the most part solid impacts resulting from the dies hitting together and not the cushion effect of a blow on soft metal between flat dies. For this reason, possibly, the breakage of rods has sometimes come to be regarded as inevitable. This

Fig. 1

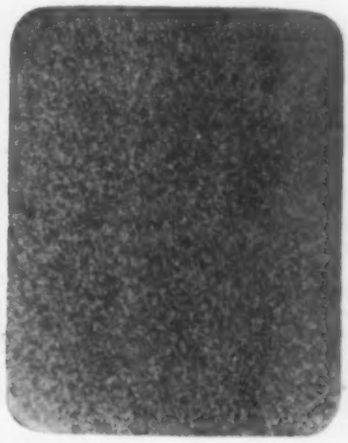


Fig. 2

Fig. 3

Figs. 1, 2 and 3.—Photomicrographs of Three Rods which Failed Prematurely in Service

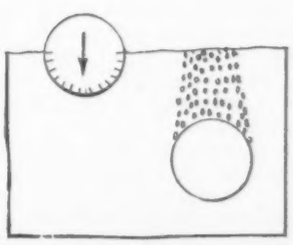


Fig. 4

Figs. 4 and 5.—Methods Used in Quenching

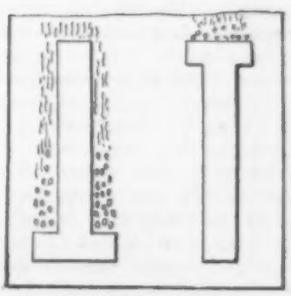


Fig. 5

Figs. 6, 7 and 8.—Photomicrographs of Steel Rods which Have Undergone the Heat Treatment Recommended

Fig. 6

Fig. 7

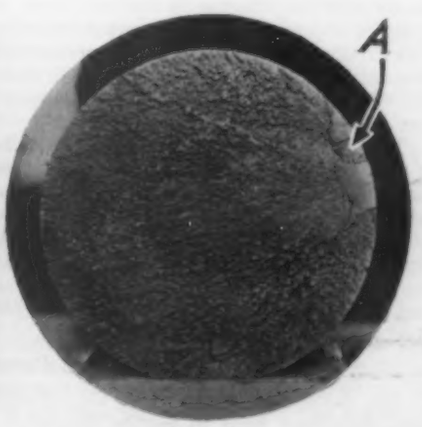


Fig. 8

attitude is both incorrect and dangerous to the best interests of the trade, for properly made rods can and do give surprisingly long runs. Examples of the faults often met with in improperly made rods are given below.

Composition.—Two features are desirable in connection with the composition of the steel used, (a) it should be the correct type of steel and (b) it should run uniform. The following are actual analyses taken from a number of rods purchased over a period of three years from one of the prominent sources of such material. All of the rods were represented as "chrome-vanadium."

	1	2	3	4	5	6	7	8	9
Carbon	0.27	0.28	0.29	0.34	0.35	0.35	0.36	0.41	0.56
Manganese	0.50	0.69	0.64	0.67	0.54	0.56	0.84	0.64	0.72
Phos.	0.009	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.024
Sulphur	0.03	0.03	0.03	0.04	0.03	0.02	0.03	0.02	0.026
Nickel	...	...	0.34	...	...	...	...	...	1.67
Chromium	0.82	1.26	0.98	0.47	1.23	0.97	1.26	1.13	0.83
Vanadium	none	0.20	none	0.23	0.20	0.21	0.19	0.21	none

An examination of the above results shows that, aside from No. 9, which was nickel-chrome steel and not chrome-vanadium at all, the carbon varies from 0.27 to 0.41; the chromium was from 0.47 to 1.26, and the vanadium from "none" to 0.23. These discrepancies do not occur, of course, in steel well cared for. The analyses indicate, also, that the steel has been made by the basic process.

Microstructure.—Photomicrographs were taken of samples from three rods that failed prematurely in service. Fig. 1 shows a rod sold with the steel in the forged condition, the structure being that of the steel as it left the forging press, annealing and heat treatment having been omitted. This rod failed after a few days' service. Fig. 2 shows a well annealed rod, but annealing will not put the grain of the steel in the condition necessary to give the longest life. Fig. 3 shows a steel with many large patches of slag, and the rod actually lasted but one hour in the hammer. The conclusion here, too, is that lack of care has been used in the manufacture of these rods, all-important though they be to the production of the hammer.

Heat Treatment.—Even with steel of the best composition and manufacture, the crude methods of heat treatment employed by some of the leading manufacturers of piston rods make impossible the proper service from the rods. The following will illustrate.

One manufacturer, using steel containing 0.25 per cent carbon, 3.50 per cent nickel, gives rods the following treatment: 1550 deg. water quench with 1200 deg. drawback. The critical temperature for steel of this composition is about 1375 deg., so that the final refining temperature which the steel with such treatment receives is 175 deg. above the critical range. Allowing for the heavy sections of some of the larger rods, this is too high to produce the best results.

Another bad practice is that of quenching the rod horizontally. The effect of this procedure is as follows: As the rod enters the quenching medium (see Fig. 4) the lower half is chilled before the upper half, thus setting up strains in the metal. After the rod is submerged, vapor bubbles arise from the upper half, the net result being that the under half of the rod is quenched in water and the upper half in vapor. Obviously, this produces an unevenly refined rod, which means uneven strains in the rod and, as the subsequent drawing operation cannot equalize the grain structure, this uneven effect is permanent in the rod, unless it should be re-heat-treated in the proper manner. These effects are more pronounced as the diameter of the rod increases.

The rod should, of course, be quenched vertically. In this manner the entire surface of the rod receives the same quenching effects and a uniform product results. In vertical quenching, should the rod have a solid head, the head should enter the quench last. (See Fig. 5.) Otherwise, with the big end down, vapor bubbles coming up from it surround the shank and prevent the liquid from producing the proper refining effects where most needed.

How to Secure Better Rods

The following paragraphs are offered as suggestions that may help to secure improved service from hammer rods where such precautions have not already been in force. Rods should be purchased under definite specifications, which should include the following:

Steel.—The steel should preferably be made by the acid open-hearth process, with ingots bottom poured in molds with hot tops. Either of the following compositions will give good results:

	No. 1 Per Cent	No. 2 Per Cent
Carbon	0.20 to 0.30	0.25 to 0.35
Manganese	0.50 to 0.80	0.50 to 0.80
Phosphorus	under 0.04	under 0.04
Sulphur	under 0.04	under 0.04
Nickel	3.25 to 3.75	.....
Chromium	.....	0.90 to 1.20
Vanadium	.....	0.15 to 0.25

Forging.—The rod should be forged from an ingot of such size that (a) where the head is to be shrunk on the reduction will not be less than 3:1, or (b) where the head is forged solid with the rod the reduction on the head will be not less than 2:1. A pressed forged rod is to be preferred to a hammered one, due to the better working of the metal in the interior of the piece.

Heat Treatment.—Rods of either of the above steels should be given the following treatment after forging:

A. Anneal thoroughly at 1600 deg., the time depending on size of rod.
B. Rough machine.
C. Heat to 1600 deg., quench vertically in water. (Remove rod at about 300 deg.)
Reheat to 1475 deg., quench vertically in water. (Remove rod at about 300 deg.)
Draw back to 1200 deg., cooling slowly.
D. Finish machine.

The effects of the above treatment on steel of composition No. 2 is shown in the photomicrographs. Fig. 6 shows a rod as received, it having undergone no treatment whatever after forging. A full section was cut off the end of this rod and given the above treatment. The resulting structure is shown in Fig. 7.

Fatigue Tests of Steel for Rods

The following tests are of further interest in the above connection. A method of test was desired that should simulate as closely as possible the conditions of a rod in the hammer. Fig. 8 shows a typical fracture of a hammer rod. This shows clearly the nature of these failures, how the fracture commences at some point "A" at one side and then progresses across the rod radially from this point. This indicates that the strains that cause such failure are vibratory, due often to the impressions in the dies not being axial with the rod. The Landgraf-Turner testing machine was selected as resembling this effect. In this machine, a test bar 6 in. long by ⅝ in. diameter is clamped at the lower end in a vise. The upper end of the bar extends into an opening, about 1 in. square, in a rocker arm. This arm is moved back and forth, both giving a blow to the test bar and also bending it somewhat at each stroke. The number of strokes required for failure is recorded automatically. The tests were made with vibrations at the rate of 300 per min. The following are the results obtained:

	Strokes	
Chrome-vanadium steel—		
Sample from hammer as received, with structure as shown in Fig. 6	376	295
	Average value	335
Sample of same rod, but treated, with structure as shown in Fig. 7	520	479
	Average value	499
0.20 carbon, 3.50 per cent nickel steel—		
Sample given same treatment as above	504	463
(Section treated, 2½ in. sq.)	Average value	484

These show the heat treatment necessary to produce an increase of 50 per cent in the fatigue-resisting qualities of the chrome-vanadian steel. They also indicate little to choose between the chrome-vanadium and low carbon nickel steels for this purpose.

In view of the above considerations, it would seem profitable protection for the busy drop forge shop to install suitable heat-treating equipment for the handling of hammer rods. Rough turned rods, ordered to definite chemical composition, could be purchased from the heavy forge shop, and then analyzed when received.

If this analysis checks, the rod could then be treated properly, and sent out for finish machining. This, of course, involves a great deal of trouble to do what should have been done in the steel mill, but it is strictly comparable with the installation of a chemical laboratory which analyzes incoming steels. If these steels were always made and handled as they should be at the steel mill, this check analysis would be unnecessary.

OIL BURNING UNDER BOILERS

Savings in Labor Prominent—Atomizing of Fuel in Entering Burner

BY L. C. BREED

THERE is steadily increasing interest in the direction of the use of oil in place of coal in the steam plants of various industries. Of late years it has developed rapidly, owing in part to the higher cost of coal, and it is estimated that the yearly consumption is over 300,000,000 bbl. In some instances the change to burning oil in place of coal under the boilers is made in part only, and a careful comparative study is conducted for a considerable period.

A case in point is that of the Boston Woven Hose & Rubber Co. of Cambridge, Mass. It has three boilers of 600 hp. each, and has been conducting an experimental operation for the past six months under the supervision of an expert mechanical engineer. Prior to taking up the use of oil, the average daily consumption of coal was 120 tons. The company is now using about 20,000 gal. of oil daily for its requirements, in part, in the production of power, while carrying on its experiment to ascertain whether or not, all things considered, oil should be used in place of coal.

The American Sugar Refining Co. has been using fuel oil at its plant in South Boston, Mass., at 100 per cent for two years. The boiler capacity of the refinery is 6000 hp. As the result of the experience of two years' run on oil, it is found that it gives 78½ per cent efficiency as compared with 65 per cent in case of coal with 14,300 B.t.u. per pound. The oil has 18,300 B.t.u. per pound. The boilers formerly burned 180 tons of coal daily.

About two-thirds of the cost of installation was due to providing underground storage tanks for a month's supply of oil. Mechanical burners are used and a saving is effected as against the use of steam atomizers in connection with burners. In using mechanical burners, oil has to be heated very hot and pumped into the fire at high pressure—200 lb. pressure and 200 deg. Fahr., whereas steam carries 80 lb. pressure and 160 deg. Fahr. Exhaust steam is used to heat the oil. A great saving is effected through the elimination of the expense previously incurred for the removal of ashes.

Delivery of Fuel Oil to Plant

Establishments situated at a considerable distance from seaboard, which for that reason cannot be supplied from dealers' storage tanks, may obtain it by railroad if they are situated near the railroad track and their business is large enough to warrant providing storage for a tank carload of from 8000 to 10,000 gal. of oil. The oil companies have for some years supplied manufacturing plants throughout New England. In winter oil must be warmed to make it flow freely to the user's tank. The tank cars are provided with coils for the purchaser's use in applying steam.

Storage tanks are usually constructed of reinforced concrete, and in most localities are required to be placed under ground. There is no increase of expense for insurance, provided the regulations of the board of underwriters for the district have been complied with.

Among notable instances of the adoption of oil as fuel are those of the Amoskeag Mills, Manchester, N. H., where it is used under a battery of 64 boilers, and the American Woolen Co., the mills of which at Lawrence and Plymouth, Mass., and Weybosset, R. I., have very large boiler capacity. The Beacon Oil Co., Everett, Mass., Revere Rubber Co., Revere, Mass., American Rubber Co., Cambridge, Mass., and many others in New England are users of fuel oil.

Two Classes of Burners

There are on the market hundreds of styles of oil burners, all of which may be divided into just two classes, according to their design: (1), The mechanical atomizing type; (2), the steam or air atomizing type.

In the mechanical atomizing type, in case of some burners, the oil is forced by pumps or gravity pressure through the passageway and, reversing its direction of flow, is forced through the small openings and strikes an abutment, where by virtue of its momentum it is atomized. The oil thus atomized continues along the abutment to its edge, where it is picked up and further atomized by a small amount of expanding steam coming through the openings. In this almost gaseous state it is then carried by the steam to the burner tip, where it is burned. Efficiency in the combustion of fuel oil is largely dependent upon the degree of atomization. In laying out a fuel oil burning system in any plant, the following matters must be taken into account: Storage, heating, straining, pumping, regulating, burning and arrangement of furnace.

Firms interested in their introduction usually superintend the work of changing the equipment of a plant from the use of coal to the use of oil. In most plants workers in the boiler room are supplied with blue glasses for the protection of their eyesight.

Reasons for Changing to Oil Fuel

Among the reasons which have induced some firms to change from burning coal to burning oil are the following: After deducting the cost of changing the equipment, they state that the first year's operation showed a considerable saving. It would seem warranted to spread the cost of the change over a period of (say) five years.

Another factor to be considered is the superior steam-making properties of oil as compared with coal. This is occasioned through more complete combustion in case of oil, due to the control of air supply and the better mixing of the air with the fuel. In hand firing of coal, the opening of doors for charging or cleaning fires results in a variable percentage of heat, and a corresponding reduction in boiler efficiency.

The storage of oil does not require nearly so much space as with coal, and the saving in space can be utilized for storage of other commodities. The cost of handling is much less. There is a saving of labor in the boiler room and there is no ash removal to be done. Boiler depreciation is cut down approximately two-thirds, and the boiler does not have to be blown out so often as when coal is used, and it prolongs the life of furnace linings.

The absence of smoke and dust is a very desirable feature, and there are no sparks or spontaneous combustion as with bituminous coal. Oil burning equipment costs considerably less than coal burning equipment. Establishments situated at considerable distance from supply dealers can be rendered secure from interruption in service through providing extra burners for use in emergencies.

Concerning the approximate cost, if coal is $10 per gross ton fired and one ton equals 2.88 bbl. of oil, then the user could afford to pay $3.45 per bbl. of oil fired. The cost of firing is about 25c. per bbl.

Fuel Oil Heaters

An important device which may be used in connection with mechanical burners is the fuel oil heater. It is the usual practice to design fuel oil heaters so that the oil will be confined to the inside of the heat-

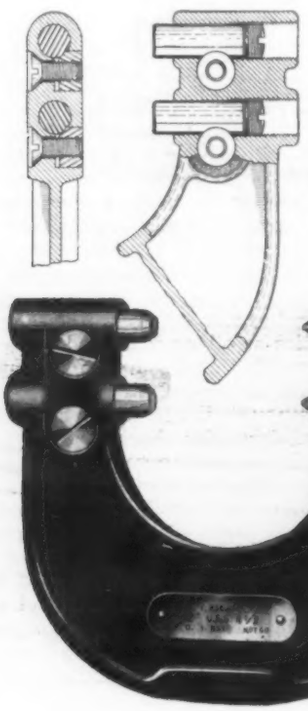
ing element, the steam being in the shell around the tubes or coils comprising the heating element. This operation may be reversed, but it is found to be preferable to use the oil tube type of heater rather than the steam tube type, both from the design and operating point of view. One company which manufactures these devices has found that two types of fuel oil heaters are necessary in order to handle all conditions of oil capacities—a coil type of heater adapting itself best to small quantities of oil, and the multi-pass tubular type of heater being best adapted for conditions where the quantities of oil are large.

Due to the tendency toward the use of heavy oils for fuel oil firing purposes, users are advised to purchase a fuel oil heater capable of handling the heaviest grades of oils obtainable. This procedure provides a heater which may be used with any grade of oil, irrespective of whether it may be a light or a heavy fuel oil, and enables the user to purchase oil from any source of supply that conditions may dictate.

Improved Snap Gage

A line of snap gages having a wide range of adjustment in each size has been placed on the market by the Greenfield Tap & Die Corporation, Greenfield, Mass.

The locking device for the anvils is a feature and the method of locking and adjusting may be noted from the illustration. The bearing of the individual locking bushings is on a flat on the anvils, a construction intended to hold the anvils securely and prevent turning, thus maintaining the alinement of the gaging faces. A reinforcing web has been added to the outer edge of the frame to increase the stiffness and rigidity. In addition to stiffening the frame, this rib is said to help the "feel" of the gage in the hand, particularly if hands and gage become slippery with oil. Provision is made for holding the gage in a stand when this adds to the convenience or speed of gaging. The frame number is cast in each frame to facilitate the purchase



The Locking Device for the Anvils Is a Feature. A reinforcing web has been added to the outer edge of the frame, as shown in the view below, to add to the stiffness of the gage

of similar gages or extra anvils. A name plate is provided for special marking.

The wide range of adjustment in each size is claimed to permit covering a given range of sizes with fewer gages, which in turn permits a saving on gages for special work or small production jobs, where it is frequently possible to reset from one size to another.

Building contracts awarded in July in 36 eastern States, according to the F. W. Dodge Corporation, amounted in value to $315,024,000, a drop of 15 per cent from the figures of June and of 22 per cent from those of July last year. The July total was about equal to the average July figures during the four years from 1919 to 1922 inclusive.

German Machine Industry Suffers Severely from Economic Disintegration

The machine industry of Germany suffered severely in 1922 from the effects of Germany's economic disintegration, according to the annual report of the Verein Deutscher Maschinenbau-Anstalton, summarized in the Industrie-und Handels-Zeitung of June 8. The association estimates the present production of the industry in weight is only half that of the pre-war period. Among the greatest difficulties that have hampered operation are the condition of Germany's currency and the resulting capital shortage, the 8-hr. day and excessive overtime wages, labor disputes, unsatisfactory supply of materials, injudicious taxation and the import restrictions of foreign countries.

These difficulties, Trade Commissioner F. W. Allport points out in a report to the Industrial Machinery Division of the Department of Commerce, have forced many hitherto unorganized manufacturers to associate, and as a result the number of organizations in the industry rose at the end of 1922 to 143, comprising 1150 concerns with between 500,000 and 600,000 workmen, about 90 per cent of producing power of the entire industry.

Supplies of raw and semi-manufactured materials apparently gave a great deal of trouble to the industry in the past year. Some factories were able to obtain but 30 per cent of the material needed, the shortage of bar iron and thin plates being particularly acute. Frequent changes in iron prices led to complete disorganization of quotations in the industry and necessitated a general agreement on uniform prices so far as practicable.

Stocks of Coke in Consumers' Hands

WASHINGTON, Aug. 11.—Incomplete returns from by-product coke and steel plants indicate that the reserve coal tonnage on hand at such plants on July 1, 1923, was about 5 per cent larger than on June 1, according to a survey undertaken by the Bureau of the Census and the Geological Survey under the authority of the Federal Fuel Distributer. Operations at such plants were curtailed somewhat during June, and the days supply on July 1 was 27, against 25 on June 1, an increase of 8 per cent. The stocks held by these important groups of consumers are now twice those on hand Sept. 1, 1922, but in spite of this progress in replacing stocks that were so nearly exhausted during the miners' strike last summer, reserves on July 1 were below those on other dates when stocks were large. The supply on Jan. 1, 1919, and on March 1, 1922, was sufficient for about 40 days.

Surplus stocks of by-product coke were accumulated in June, and the total on hand on July 1 was 308,000 tons, an increase of 52.5 per cent over the supply on June 1. Despite this increase, however, stocks of by-product coke were less than half those on March 1, 1922, when the reserve tonnage was the heaviest.

Owing to the duplication of reports from one large producer who stores coal at the mines, the figures of mine storage recently published have been too high. The total held on July 1 by the producers that reported was 688,000 tons, against a revised figure of 778,000 tons on June 1. This was a decrease of approximately 12 per cent.

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A New Steel Works Epoch

The present week marks an epoch in the steel industry, in view of the change that will be made on Aug. 16 in several centers of production from twelve-hour to eight-hour working shifts. The change amounts almost to revolution, and might be called that but for the fact that it will be a matter of months. Many things will come from it of which not a word has been said in many pages of newspaper writing. Ultimately plant modernization to the highest degree is involved, and expenditures of money even beyond the prodigal scale that long has been forced on the industry by the march of processes and the modern economic trend. In scores of communities life must be adjusted to a new cycle and the personnel of the industry will undergo important changes.

If there is one thing that stands out more than any other, as the leaders in the industry take up their prodigious task, it is the spirit of the operating managers. Not only are these men making every effort to bring about the change, but they entertain no peradventure of failure. They are the ones who wrestle with the human problem and with every shortage of labor. It is they who must keep up production and at lowest possible costs. They could make formidable lists of objections and of reasons for delay in the face of pressure for output. Yet these men quite generally are enthusiastic for the change. Some of their expressions disclose long latent views in favor of the short workday. It is idle to suggest that this attitude is unanimous, but the number who still want to dwell on the difficulties is small and they raise no argument against the principle. The will to do among so many is sure to bring into line those holding back.

Improvement of plant facilities will have attention to a degree rarely known. The less fit plants naturally will go from high cost to higher, but cannot long remain so and be active. The need is not merely for more mechanical handling to replace manual labor or for automatic contrivances where perhaps none now exist. Capable plant managers are scarce. Lines of succession show gaps that must be filled. Similar aggregations of plant apparatus, with materials and facilities substantially identical, give results varying as much as 20 per cent. Management personnel has not kept pace in all cases with the physical development.

More than ever under the new régime, operating heads must have the make-up that can deal successfully with the human factor. Mastery of processes and of mechanism will be as essential as heretofore, but in the transition of which this week marks the beginning right insight into the man problem is of paramount importance.

The Quality of Galvanizing

Go into an ordinary hardware store and buy a galvanized turnbuckle, install it for some purpose out of doors, examine it after two or three months, and likely it will be found already to show evidence of rusting. Go into a ship chandler's store on the water front and buy almost any form of galvanized iron. It will be obvious to the eye that it is a substantial, well-coated article, producing a confidence in its durability. There is an industrial and economic lesson to be learned from these homely remarks.

There has been a good deal of discussion recently respecting the quality of the galvanizing that we are doing in this country. It has been charged that our galvanizers have thinned the zinc coating so that our galvanized sheets and wire are no longer durable. It has been alleged that this impairment of quality is jeopardizing both our domestic trade, wherein consumers may turn to substitutes, and our foreign trade, wherein we were supposed to be constrained to meet the competition of good foreign galvanized wares.

Dr. W. R. Ingalls has recently shown that the last representation is founded on a fallacy; that British sheet galvanizers have been doing the same thinning as American. As for the rest, however, there is substantial agreement. Zinc producers, who are naturally desirous of having the maximum use of spelter, make charges and galvanizers admit them. In truth, there is no controversy between zinc producer and galvanizer, but rather a community of interest, which, of course, will make it easy for them to cooperate.

The subject is in reality an economic one. To the ordinary user of galvanized ware it all looks

alike. Competition among galvanizers is so keen that everyone is constrained to pare costs as much as possible. If anybody increased his cost and consequently his price by putting more spelter on the steel he would lose business, inasmuch as users, generally ignorant, would not pay the price, but rather would take something looking the same and offered more cheaply. Mariners are not ignorant respecting this subject. Knowing what they want and demanding it, galvanizers give it to them, just as they would to other customers who were similarly informed and insistent. Therefore the real economic objective is the education of users, and for that reason the more discussion of the subject there is the better will it be for everybody. Galvanizers themselves could well afford to enter upon plans for educational propaganda.

The Price for Wheat

The price for wheat is low owing to the inability of this country to market its surplus abroad in competition with other wheat growing countries at anything but low prices, the diminished demand of Europe, owing to its poverty, being largely responsible for this. Also, Europe has been raising more wheat of its own. The price for copper is relatively low, for the same reasons, more or less. Copper is, however, an industry that is left to work out its own salvation. There are fewer than 100 copper producing companies. There are many thousands of stockholders, to be sure, but politicians pay no attention to them. The number of men engaged in the production of copper, from mines to the exit gateways of the refineries, is only about 50,000. On the other hand, there are 2,500,000 farmers in the principal wheat-growing States, and they are naturally the concern of politicians. Their position is indeed a concern of the whole country, for there can be no such thing as national prosperity when so large a percentage of the workers are in a state of despair.

However, the remedies that are proposed by charlatans, quacks and false prophets are so alarming by virtue of their disregard of the simplest principles of economics as to cause us to stand aghast. The suggestion that all of the people of the United States be led to eat more bread is indeed in conformity with the law of supply and demand, but if more bread be consumed than is needful there is a direct invitation to profligacy in living which must be at the expense of the creation of capital goods. The chances are that the townspeople are already eating all the bread they want, wherefore this suggestion is humorous rather than serious, although Mr. Gompers had previously offered it as a reason why the farmers should cooperate with organized labor and connive with the latter in its plans for higher wages.

The proposal that the farmers should correct the evils from which they suffer by curtailing their production is made in flat defiance of the economic principle that people live and prosper out of the goods that they produce, unless they divert their attention to something else, which probably is not what is intended. Otherwise this suggestion is equivalent to recommending that the American people should determine to live a self-contained existence, abandon their foreign trade, and become poor in goods and comforts, although all expressions in dollars might be written up enormously.

Other suggestions are that the farmers withhold their surplus wheat, or that the Government buy it, neither of which would ameliorate the situation, as anybody experienced in markets well knows. Finally, there has been the preposterous suggestion that the Government revert to the war policy of price-fixing. This would be a repudiation of the law of supply and demand that would be about as sensible as a denial of the law of gravitation.

What the wheat farmers need are broader markets and reduced costs. Rehabilitation of Europe is the great road to enlargement of markets, but in order to develop it we must let down the barriers in the return road from Europe to us. That would tend to reduce the costs in this country. The cure for existing industrial evils is the removal of economic restrictions, not the erection of more of them. We shall be bound always to hark back to this simple formula, though it may be a long time in obtaining, partly for the reason that the majority of people do not understand our economic position and partly for the reason that it is contrary to many selfish interests.

Habits in Forecasting

The physical details of the business cycle have been quite fully analyzed of late. Inasmuch as we do not all depend exclusively upon the charts in forming our expectations as to the future of business, but pay some attention to the recurrent reviews by the various authorities, it might be useful to construct some sort of chart of the changing views and arguments of the reviewers as the various stages of the business cycle are passed.

Such a chart would expose and emphasize some remarkable inconsistencies. With a little effort of memory one can readily recognize that the various physical facts of business are differently regarded and differently interpreted, by the same class of commentators, at different times. For a striking illustration, we have it that in time of depression one observes that much emphasis is placed upon real or supposed "needs" of the people, as an argument that business is going to become much better, and very soon, while little is said about the presence or absence of buying power. On the other hand, when industrial activity is on a high level and the reviewers feel it will be safer to begin talking the other way, little is said of either needs or buying power. Yet we know perfectly well that needs do not count if there is not the buying power to satisfy them, and from personal experience almost anyone is likely to conclude that if buying power exists and needs are not recognized the needs will promptly be thought up.

The mental attitude as to volume of production likewise changes from time to time. At one stage

low production is spoken of as if there were an economic law that low production is always a bad thing. At another stage high production is spoken of as the bad thing. That is because mental attitudes change with the times. Viewing at long range anyone can see that either low production or high production may be bad, in a given commodity, according to whether or not it fits the circumstances. High production is not necessarily excessive nor is low production necessarily deficient.

At nearly all times the reviewers are prone to underrate the importance of buying power. Industrial activity cannot slow down rapidly when there is large buying power. The collapse of 1920 is better understood now than it was at the time. Then there was much talk of there being "a buyers' strike." The later and more likely conclusion is that buyers did not deliberately go on strike. Their money ran out because some sellers were getting so much of it that there was none left to spend with other sellers.

Men who predict poorer business ahead may feel that they are doing their fellow men a service, but they should not neglect to realize the great responsibility they assume. For our advancement and prosperity we need goods and the money with which to buy them. When a business forecaster induces a manufacturer to curtail his production two things occur: the production of goods is decreased and the buying power is likewise decreased. The advice may be good and in the long run benefit may result. There is an equally heavy responsibility when advice is given to business men to enlarge their facilities and make capital outlays on the ground that better business is coming. It may be more profitable to defer expenditures. It is no light thing to urge men at one time to spend their money freely and at another time to advise them to stop circulating money. One has a right to ask that the same attitude and the same philosophy obtain at all times when the physical facts of the situation are up for comment.

While our imports of manufactured articles and of raw materials for manufacture have been growing, exports of corresponding classifications have also increased. For the fiscal year ended with June the imports of manufactures and raw materials, that is, imports other than foodstuffs, totaled $2,904,000,000 in value, or nearly 50 per cent more than came in during the preceding fiscal year. Meanwhile the exports rose to practically the same total, $2,901,000,000, though only one-seventh more than for the fiscal year ended with June, 1922. The classification is three-fold. The importation of crude materials for use in manufacturing reached a value last year of $1,476,000,000, or five-eighths more than for the year preceding, while the exports of such materials amounted to $1,018,000,000, or one-tenth more than for the year preceding. The importation of manufactures for further use in manufacturing was three-fourths more than the 1921-1922 importation, reaching $711,000,000, while the exports increased only 18 per cent, reaching $487,000,000. The imports of manufactures ready for consumption, however, increased only one-eighth, or to $717,000,000, while the exports of completed manufactures increased 15 per cent, or to $1,396,000,000. As noted above, exports, while not increasing at anywhere near the rate of imports, actually balanced the latter.

Wages Now Buy More

Figures compiled by the National Industrial Conference Board, New York, comparing the present situation with the so-called prosperity period of 1920, show that the real earnings of the American wage earner are higher today than then; that is, they have a higher purchasing power, to the extent of over 15 per cent, and 36 per cent higher than in 1914. This indicates that the worker is in a more prosperous condition than for a long time.

The calculation is based on a study of conditions in plants employing more than 600,000 hands. The figure for June, 1920, showed that the weekly earnings at that time were 2.40 times those of July, 1914, while the cost of living figured out at 2.03 times as much as in the earlier month. Thus the purchasing power obtained by dividing the wages by the cost of living showed 1.18 times as much as before. Since that time of exceptionally high prices and wages there has been a heavy decline in the cost of living and there was a temporary decline in wages. Wages, however, have gone back toward the high figure of 1920, until in May of this year they stood at 2.18 times the 1914 level. For the same month the cost of living was 1.603 times the 1914 figure. Thus the real weekly earnings based on purchasing power were 1.36 times as great as in 1914, that is, the wage earner was 36 per cent better off than before the war.

As is the earning status of the 600,000 reported on, so undoubtedly is that of most of the 10,000,000 industrial workers of the country. Such being the case, we have in this one item of increased purchasing power an important contribution to the present strength of the business structure.

COMING MEETINGS

August

American Institute of Mining and Metallurgical Engineers. Aug. 20 to 30. Quebec and other places in Canada. F. F. Sharpless, 29 West Thirty-ninth Street, New York, secretary.

Lake Superior Mining Institute. Aug. 29, 30 and 31. Twenty-third annual meeting, Hotel Spalding, Duluth, Minn. A. J. Yungbluth, secretary.

September

Chemical Industries. Sept. 17 to 22. National exposition, Grand Central Palace, New York.

Association of Iron and Steel Electrical Engineers. Sept. 24 to 28. Convention and exhibition, Auditorium, Buffalo. J. F. Kelly, 1007 Empire Building, Pittsburgh, secretary.

American Electrochemical Society. Sept. 27 to 29. Annual meeting, Dayton, Ohio. Dr. Colin G. Fink, Columbia University, New York, secretary.

Eight-Hour Day Summarily Established

(*Continued from page* 400)

ber of men now working 12-hr. turns, and where this is not possible, as much capacity will be kept on as there are men available. As has been announced previously, common labor employed in continuously operated departments is to be paid $4 per day of 8 hr. as against $4.80, now paid for 12 hr. No change in the rate of pay is contemplated among the workmen in blast furnace and open-hearth furnace departments who are rated higher than common laborers or who are paid on a tonnage basis, but there will be a good many promotions in the creation of the extra crews made necessary by the change and these promotions carry with them increased remuneration. Second helpers in open-hearth plants will be advanced to first helpers and first helpers to melters and these advances will bring higher wages, since they call for higher scales, all of which are based on the tonnage produced for the 24-hr. period of the entire department and not on the output of any one furnace or group of furnaces within a plant. Extra blowers will be required in applying the change at blast furnaces.

The fact that common labor in continuously operated departments are to receive $4 for eight hours' work, while those working around the noncontinuous departments will receive the same remuneration for ten hours, constitutes a problem that must receive early consideration if the noncontinuous departments are to avoid being riddled of common labor by the continuous departments providing the shorter workday. That is one problem that is bothering the independent steel companies and they also claim that the lack of sufficient housing facilities makes it impossible to bring in additional men. Most of them have enough business to keep going pretty full for the next 60 days and they hesitate about adopting the plan of reducing capacity to the extent of the available labor supply for three 8-hr. shifts.

Bar, plate and pipe mills now are on a 10-hr. basis and probably will continue so for the present. In wire mills, the 12-hr. day is common in the finishing departments and its elimination is going to be difficult, since wire drawing is one kind of work that does not attract men and for some time past a marked shortage of that kind of labor has existed. The change constitutes the least disturbance of all in the sheet and tin plate mills, which for years past have been on an 8-hr. basis.

A Year to Complete Change Expected in Chicago

CHICAGO, Aug. 13.—Both the Inland Steel Co. and the Illinois Steel Co. today took initial steps toward the elimination of the 12-hr. turns in their respective plants. Approximately 150 new blast furnace employees were added to the payroll at the Indiana Harbor plant of the Inland company and as soon as these men are broken in the blast furnace department will be operated on three shifts of 8 hr. each. The next step will be the conversion of the open-hearth department from a two-turn to a three-turn basis and then the by-product coke ovens. The greatest increase in labor will be required in the finishing department, where the change in the working day will be made last. The entire abandonment of the 12-hr. turn is a task full of complexities, and it is proposed to accomplish it deliberately, so that operations are not affected adversely. It is estimated that the complete change may take a year.

The hourly wage of common labor on the 8-hr. shifts has been advanced 25 per cent, or from 40c. to 50c. This will mean a daily wage of $4 as compared with $4.80 for a 12-hr. turn. A considerable number of men have expressed a desire to work two 8-hr. shifts, but this will not be permitted by the management.

The Illinois Steel Co. gave out no details regarding the steps it is taking to eliminate the 12-hr. day, but it is understood that it also is starting with the blast furnace departments of its respective works. The following statement on the subject was given out today by E. J. Buffington, president of the company:

"The Illinois Steel Co. is working on plans for the elimination of 12-hr. turns in its steel plants in conformity with the recent announcement of Judge Gary, as president of the American Iron and Steel Institute. The progress which we shall be able to make immediately depends upon the availability of additional workmen required for changing the hours of work at our mills. Effective today some of the 12-hr. turns at some of our steel plants will be eliminated by substituting therefor 8-hr. turns for some jobs and 10-hr. turns for others. It is impossible to state at present the extent of such changes or the number of workmen affected."

Preparing for the Change at Cleveland

CLEVELAND, Aug. 14.—Cleveland steel manufacturers will make careful preparations to abolish the 12-hr. day; in fact they have been doing so for months, but their efforts have been intensified since the American Iron and Steel Institute made the definite promise to President Harding that the change in hours would be effected as soon as possible.

The change at Cleveland plants will not be so revolutionary as might be supposed. The most important company affected involving the greatest number of men is the American Steel & Wire Co., but at its plants few employees, except in the coke, blast furnace and open-hearth departments, are working 12 hr. In the blooming mills, for instance, 8-hr. shifts are in effect, and in other rolling mills the men are on an 8-hr, or 10-hr. basis, with the exception of a few connected with power plants.

In some departments of the American Steel & Wire Co. the superintendents are now ready to make the change, but it will not be made until word comes from other plants of the Steel Corporation. For example, it would not do to introduce the 8-hr. shift in the blast furnaces in Cleveland and not do so at Lorain, only 20 miles distant, for instances are reported in which men who have had an opportunity to work the longer hours and make more money by going from one plant to another have done so. The Steel Corporation, in introducing the six-day week, found that some men chose to go where they could work seven days in order to make more money.

At the Upson nut plant of the Bourne-Fuller Co. the 8-hr. day was introduced several years ago. One of the officials of the company, in speaking of the change, said "it came about naturally without friction and without giving the men more pay per hour, and it has worked smoothly."

At the plants of the McKinney Steel Co. conditions are similar to those at the plants of the American Steel & Wire Co.; that is, the men are on the 12-hr. day in plants in which the processes are continuous. This company and the Otis Steel Co. have given much study to the problem and are ready to introduce the shorter day at an early date, but it is noteworthy that none of the responsible officials of any of the steel plants mentioned is willing to say that there will be any sweeping change next Thursday, the date which has been set as the beginning time for the change.

The Matter of "Loafing Time"

An important operating official among the steel plants when asked whether he had been able to obtain an expression of opinion as to the attitude of the men in regard to abolishing the 12-hr. day said: "We know very little about how the men feel. There was more or less

discussion before the announcement of the change was made in New York, but since a definite position has been taken by the steel manufacturers the men have kept quiet and we have very little information as to their attitude."

"Has the situation as to labor supply changed any recently?"

"Yes, it has improved. It has not been necessary for us to keep out our scouts looking for men. All the men we have needed of late have come to the plants and asked for work.

"I should like to correct one impression in regard to the men loafing on the job," said this operator of long experience in steel plants. "While some people think that the 12-hr. men are compelled to work very hard all the time, other people have the notion that there is a lot of loafing. It is true, of course, that common laborers have long periods in which they can sleep, or play cards, or do anything they want to do, but it is also true that most of the men around a steel plant have responsibilities from which they are never free while they are on duty. Their work has been compared with that of a housewife who leaves something on the stove cooking while she goes about other duties, or even visits with the next door neighbor. That is not a bad comparison. For the woman has her cooking on her mind, and so it is with most of the men about a blast furnace or steel plant. They must be awake, must be thinking of their work, and must be ready to act at any time.

"There is another thing. No one should imagine the men are not thinking. Many of them, of course, have had little schooling, but there are good minds among them, and, after all, that is the important thing."

The subject of costs is, of course, a highly important one. The accounting departments of the steel plants are working as they have seldom worked before in endeavoring to ascertain what the costs will be, but little that is definite can be said on this point at present.

Three Shifts Started in Milwaukee on Monday

The Bay View works of the Illinois Steel Co. at Milwaukee introduced the 8-hr. workday on Aug. 13 by placing the men in mill No. 29 on a three-shift instead of a two-shift basis. The change will be made in remaining departments as rapidly as additional men can be obtained and operating convenience permits.

The rolling department for the present will work on a 10-hr. basis without change in the wage rate.

GERMAN IRON AND STEEL MARKET

Quotations Based on Pound Sterling to Avoid Effects of Mark Fluctuation

(By Radiogram)

BERLIN, GERMANY, Aug. 13.—Iron and steel prices henceforth will vary automatically according to exchange rates between the mark and the pound sterling.

[Last week foundry iron No. 1 was quoted by the Pig Iron Association at 26,220,000 m. per metric ton, representing $11.99 per gross ton, at 45c. per 1,000,000 m. Steel ingots were held by the Stahlbund at 31,968,000 m. ($14.62); steel bars at 46,250,000 m. (0.94c. per lb.); thin steel sheets at 77,102,000 m. (1.57c. per lb.).]

Favors Selection of Immigrants Abroad

WASHINGTON, Aug. 14.—President Coolidge is in strict accord with Secretary of Labor Davis concerning the problem of immigration. This was made clear today at the White House following the first Cabinet meeting under the Coolidge Administration.

Announcement was made that the new Administration would follow the Harding policies and emphasis was laid on the fact that this includes the matter of immigration. Present at the meeting were all of the members of the Cabinet except Secretary of the Treasury Mellon, who is returning to the United States from an European trip.

Secretary of Labor Davis briefly outlined at the Cabinet meeting his observations during his recent trip in Europe regarding immigration, and it was said that he returns to the United States even more firmly convinced than previously that it is necessary in the selection of immigrants to the United States to depend on visés of American consulates. It was pointed out that President Coolidge strongly approves of this suggestion and that he is of the opinion that the only legislation concerning immigration at the next session of Congress will relate to the revision of the present law providing for selection abroad.

It was declared that the President took the attitude that it is necessary to obtain a reasonable number of immigrants, but that they must be of the very best type. It was pointed out that the President considers it necessary to obtain labor for industries in the United States, but that it is more fundamental to admit only the aliens who will be absorbed into the highest kind of American citizenship. Secretary Davis, it was declared, is prepared to take up several plans relating to immigration, but that the only prospective legislation now in contemplation will deal with the selection of immigrants in the countries where they originate.

To Make All Steel Household Refrigerators

A. H. Dillon and associates of Youngstown, Ohio, have organized the Metropolitan Steel Co. to manufacture all-steel refrigerators under the Walker Vacuum Refrigerator patent. Mr. Dillon was formerly assistant manager of sales of the Youngstown Sheet & Tube Co. and more recently president of the H. C. Tack Co., Cleveland, which was sold to the Atlas Tack Co., Fairhaven, Conn.

The Metropolitan Steel Co. has purchased a property at Mineral Ridge, in Trumbull County, consisting of a factory building previously intended for the manufacture of steel tubing. It reverted to the Austin Co., Cleveland, the builder, and was sold by them. The building has 60,000 sq. ft. of floor space, while the property contains seven acres, with railroad frontage.

Machinery is to be installed to have the plant in operation by fall. The plant, it is expected, will use about 1000 tons monthly of No. 16 gage enameling sheets. The company is capitalized at $350,000, with an Ohio charter.

Mr. Dillon is president of the company; Sheridan A. Walker, New York, is vice-president, and W. F. Pattengell is secretary-treasurer. The officers and James I. Stephenson and Sidney E. Anning, both of Cincinnati, comprise the board of directors. Mr. Walker will move to Youngstown to engage in the production department of the company. He is the inventor of the steel vacuum refrigerator, designed to replace wooden refrigerators used in the home. He is a pioneer in developing uses of pressed steel for household furniture and in passenger coaches.

Mr. Pattengell was formerly credit manager of the Brier Hill Steel Co. Mr. Anning is sales representative in the Cincinnati district for the Sharon Steel Hoop Co., while Mr. Stephenson is vice-president of the Guaranty Trust Co., Cincinnati, and a former president of the Cincinnati Iron & Steel Co.

Net earnings of the Class I railroads for the first six months of the year are reported by the American Railway Association at $443,912,000, or at the annual rate of 5.64 per cent on their tentative valuation. This compares with $349,069,000, or at the rate of 4.53 per cent, for the first half of 1922. The earnings are not evenly distributed, the New England district showing only 1.26 per cent, while the Great Lakes district shows 6.53 per cent. The others are between these two extremes.

Making Steel Castings Tough as Forgings

Preliminary Treatment to Produce Homogeneity in Austenite Essential to Ideal Metal Structure—Alloying Elements May Be Used to Advantage

BY L. R. MANN*

IT is a common belief among users of steel that where strength and toughness are requirements, the metal must be subjected to mechanical work previous to final heat treatment. In pursuance of this belief, the history of some such common part as an automobile crankshaft from the time the metal leaves the steel-making furnace to the time when it is ready for the machinist is a long and expensive one, whereas, in the majority of cases, the steel may be poured directly from the furnace into molds giving it its final shape. Then, by proper heat treatment, properties may be imparted to the metal which are comparable to those found in the best forged steels.

A preliminary requirement for such high-grade castings is the pouring into the molds of "dead," or thoroughly deoxidized, steel. For this reason the steel should be made, or at least finished, in the electric furnace. Such steel has approximately the same specific gravity as forged steel, so any superior qualities that may be found in the latter must be due to more suitable internal structure. Hot work followed by proper heat treatment gives to medium carbon steel a very fine-grained structure, and tiny particles of ferrite embedded in the sorbite matrix are completely isolated by the sorbite. In an untreated casting this weak ferrite is found in a network, or at least in a broken reticule. Subjected to *ordinary* treatment, this network is only slightly affected and remains in sufficient degree to differentiate cast steels physically from forged steels.

For a long time this was accepted as an unchangeable condition and no inquiry was made into the causes underlying the manner of ferrite separation. Recent theory, tested by experiment, is that the course of secondary crystallization of the ferrite, as the temperature falls through the critical range, depends on the degree of homogeneity existing in the austenite from which this separation takes place. A preliminary treatment to bring about homogeneity in the austenite is therefore necessary to obtain an ideal structure in cast metal. To show why the austenite lacks homogeneity, the course of cooling in an alloy of the solid solution type will be traced.

Consider *XZ* (Fig. 1) any binary alloy in which the components are soluble in all proportions in both liquid and solid states. Now an alloy of compositin *B*, being completely molten at temperature *t*, on cooling to *t'* starts to separate out crystals of composition *C*. On cooling, the composition of the solid separating out follows the solidus line *CF*, so that at temperature *t"* the separating solid is of composition *N*. Thus the nucleus, of composition *C*, is the center of a crystal consisting of layers *XZ* solid solution, ever becoming richer in *Z*. Now, should diffusion take place with infinite rapidity from the outer region of higher *Z* concentration toward the center, the difference in concentration between succeeding layers will disappear, and the line *CF* will at all times represent the composition of the entire solid portion. When *t"'* is reached, the composition of the solid separating coincides with the alloy composition, and the entire mass is solid.

Diffusion in a solid actually takes place, however, far too slowly to have the above ideal condition even approached in practice.

Diffusion acts just rapidly enough so that the nucleus of composition *C* becomes slowly enriched in *Z*, its composition following the line *CK* as the temperature falls. *CF* at any time represents at any temperature only the composition of the surface of the crystal. Line *CL* follows the average composition of the crystal and, as the average composition of solid separating out reaches the alloy composition, final solidification occurs at temperature *t""*. The mass then consists of crystals whose internal composition varies from composition *C'* at the nucleus to *F"* at the periphery.

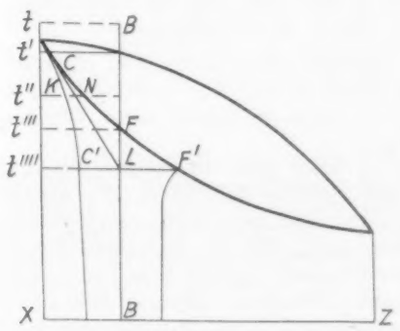

Fig. 1 (Left) Any Binary Alloy in Which the Components Are Soluble in All Proportions in Both Liquid and Solid States

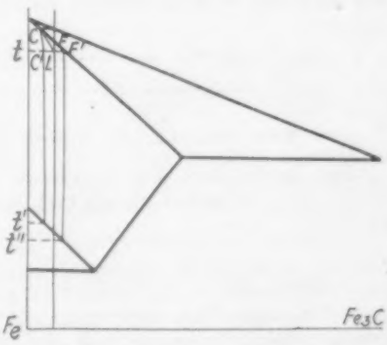

Fig. 2 (Right) Iron-Carbon Constitution Diagram

Throughout the range of steel composition and above critical temperatures, the iron-carbon diagram is of the solid solution type, in which cooling occurs as above described. As a result the austenitic crystals making up the mass vary individually in composition from a low carbon nucleus to a periphery high in carbon. The importance of this fact lies in the resulting effect on the manner of separation of the ferrite as the temperature descends through the critical range.

Reference to the iron-carbon constitution diagram (Fig. 2), shows that through the upper range of primary crystallization a condition occurs just as explained in detail regarding the solid solution alloy *XZ*. As a result, at temperature *t* the austenite consists of crystals having a low carbon nucleus of composition *C'* and a higher carbon periphery of composition *F"*. At an ordinary rate of cooling, diffusion has time to lessen this difference of composition very little, so that the low carbon nucleus reaches temperature *t'* at which ferrite starts to separate out some time before the periphery reaches the temperature of ferrite separation (*t"*). Thus the nucleus of primary crystal determines the nucleus of a ferrite crystal, and the ferrite congregates around a predetermined number of centers. The result is that ferrite accumulates in masses which touch in many places and form a ferrite network.

Considering a hypothetical case, assume now that the austenite is perfectly homogeneous. The temperature of first ferrite separation is then reached by the entire mass at the same instant. A multitude of nuclei then form throughout the mass and, in the resulting structure, tiny ferrite crystals will be uniformly dis-

*Sivyer Steel Castings Co., Milwaukee. Paper presented before Wisconsin Foundrymen's Association.

tributed. Steel of such structure has, in the highest degree, the qualities of strength, ductility and shock resistance.

Although a perfectly homogeneous austenite can never be completely realized in practice, such a close approximation may be obtained as to produce in cast steels a structure similar to that found in forgings. The necessary treatment consists of subjecting the steel to a temperature considerably above the critical range for a time long enough to permit the process of diffusion approximately to equalize the composition. The steel should then be cooled slowly to a temperature just above the critical range. A rapid cooling through the critical range then supplements the effect of the homogeneity treatment in bringing about the dispersion of the ferrite.

Quenching leaves the metal in a state of internal strain and a reheating or "drawing" is necessary to eliminate this. The structure of the eutectoid matrix is a function of the temperature at which this final operation is carried on and, in order that the eutectoid may consist of sorbite (unresolved pearlite), the "drawing" should be at a temperature of 550 deg. C. (1022 deg. Fahr.).

In a steel of 0.3 per cent carbon content, the ferrite is agglomerated in large crystals forming a practically continuous network. As ferrite has a tensile strength of only 36,000 lb. per sq. in., it is no wonder that such steel has inferior qualities. The properties of a 0.3 per cent carbon steel in such condition are about as follows:

Tensile strength.....65,000 lb. per sq. in.
Elastic limit.....35,000 lb. per sq. in.
Elongation .....12 per cent
Reduction of area..... 5 per cent

Heat Treatment to Reduce Grain Size

The impact test, the importance of which is generally underestimated, shows very low shock resistance for such a steel.

An ordinary method of heat treatment in the steel foundry is simply to heat the castings to a temperature slightly above the critical range, and allow them to cool slowly. It is a common belief that such treatment reduces the grain size and is of considerable benefit. The austenite from which the second separation of ferrite takes place is substantially unaltered from its original condition, and it is hard to see why this treatment should be of material benefit, aside from a tendency to lessen internal strains incurred during first cooling. Even when the steel is quenched in oil after such treatment, there is little alteration of the original ferrite network. Average figures for a steel subjected to such treatment follow:

Tensile strength.....67,000 lb. per sq. in.
Elastic limit.....38,000 lb. per sq. in.
Elongation .....15 per cent
Reduction of area.....10 per cent

The impact resistance is also slightly increased.

It becomes evident that ordinary treatment does not give to cast steel properties comparable to those of good forged steels, and in the large interlocking grains of ferrite can be seen the reason.

Striking structural changes are brought about as a result of obtaining homogeneity in the austenite. In a preliminary treatment, which has been only partially effective, the steel was held for 5 hr. at 900 deg. C. (1652 deg. Fahr.). One specimen was furnace cooled, enough power having been left on so that the descent through the critical range required 2 hr. The ferrite grains were still rather large, but the treatment resulted in their independence and random placing. The other specimen was oil quenched through the critical range. The grain size was well reduced, but the effect of insufficient homogeneity in the austenite was still to be seen in the tendency of the ferrite to localize in distinct areas.

But in a homogeneity treatment as stringent as would be expedient in practice, both specimens were heated 7 hr. at 950 deg. C. (1742 deg. Fahr.). One specimen was slowly cooled and, although the ferrite thus had opportunity to dispose itself at will, it was found well distributed and the grains reduced in size and independent. When the other specimen was quenched in oil, after a sufficient preliminary treatment, all traces of continuity in the ferrite disappeared and the grain size became minute. The structure corresponds to that of the best forged steels. In testing cast steels of similar carbon content, Giolliti showed the following properties to be obtainable with such methods of treatment.

Tensile strength.....90,000 lb. per sq. in.
Elastic limit.....63,000 lb. per sq.in.
Elongation .....24 per cent
Reduction of area.....40 per cent

He also obtained a tensile impact resistance of 135 kg-m. as compared to 132 kg-m. in a properly treated forging of the same carbon content.

The steel foundry is in no way limited to the use of plain carbon steels in making castings. Alloying elements can be used with as great beneficial effects as in forgings. An alloy with from 2 to 3 per cent nickel, properly heat treated, shows properties about the same as a forged nickel steel. The same general considerations apply in the heat treatment of nickel steel as in the heat treatment of plain carbon steel. The effect of the alloying element is twofold: In solution in the ferrite it strengthens that element; it also tends to increase the number of ferrite nuclei appearing as the metal, on cooling, reaches the critical range.

JULY STEEL OUTPUT

Daily Rate 3,500 Tons Less Than in June—Year's Rate About 43,725,000 Tons

A new low record for the year in steel ingot production was registered in July, the daily rate having been about 140,600 tons, a decline of about 3500 tons per day from June.

According to statistics gathered by the American Iron and Steel Institute, the July production of companies which made 95.35 per cent of the country's total was 3,352,474 gross tons. This means a total for the country of 3,515,966 tons or 140,639 tons per day for the 25 working days. This is a decline of about 17,100 tons per day from the peak in April. The tables follow, in gross tons:

Monthly Production of Steel Ingots, January, 1922, to December, 1922. Reported by companies which made 84.15 per cent of the Steel Ingot Production in 1922

Months. 1922	Open-hearth	Bessemer	All Other	Calculated Monthly Production All Companies	Approximate Daily Production All Companies
Jan. .	1,260,809	331,851	822	1,891,857	72,764
Feb. .	1,395,835	348,571	616	2,071,772	86,324
March	1,918,570	451,386	795	2,814,667	104,247
April.	1,997,465	445,939	1,109	2,902,240	116,090
May.	2,214,774	494,893	1,474	3,218,794	119,215
June.	2,143,708	487,851	2,918	3,127,775	120,299
July	2,020,572	464,047	2,485	2,952,806	118,112
Aug..	1,807,310	404,379	2,893	2,629,256	97,380
Sept.	1,911,147	460,127	2,505	2,818,261	108,395
Oct..	2,352,207	518,010	2,198	3,410,265	131,164
Nov..	2,360,903	525,945	2,449	3,430,309	131,935
Dec..	2,241,104	536,214	2,572	3,300,416	132,017
Total.	23,624,404	5,469,213	22,836	34,568,418	111,511

Monthly Production of Steel Ingots, January, 1923, to July 1923. Reported for 1923 by companies which made 95.35 per cent of the Steel Ingot Production in 1923

Months. 1923	Open-hearth	Bessemer	All Other	Calculated Monthly Production All Companies	Approximate Daily Production All Companies
Jan.	2,906,892	728,270	9,467	3,822,369	141,569
Feb.	2,613,564	669,903	10,797	3,454,918	143,955
Mar.	3,046,309	799,525	12,841	4,046,854	149,883
April	2,974,579	772,485	13,933	3,944,412	157,776
May.	3,136,558	847,418	16,719	4,195,800	155,400
June	2,821,239	737,845	15,483	3,748,890	144,188
July	2,660,094	680,884	11,496	3,515,966	140,639
7 Mos..	20,159,235	5,236,330	90,736	26,729,209	147,675

Preliminary estimates by the United States Geological Survey place the world's 1922 output of coal at 1,208,000,000 metric tons, of which the United States produced 417,646,000 tons, or 34.6 per cent. This compares with 1,136,000,000 tons, 459,392,000 tons and 40.4 per cent, in 1921. In 1918 the United States produced 46.4 per cent of the total of 1,331,000,000 tons.

RAILROAD OPERATING SITUATION

Heavy Traffic Well Handled, but Appeal to Level Off Peaks of Fall

WASHINGTON, Aug. 14.—Appeal is being made to shippers and consumers, by the car service division of the American Railway Association, to continue and augment during the next 30 days their efforts to level off the peak of shipments during the coming fall. This is one of the many steps being taken by the railroads to avoid car shortage, and reports coming to Washington indicate that the iron and steel industry is lending its cooperation to the fullest extent. The showing being made by the railroads, both from a point of net earnings and expediting of freight, is a source of gratification to officials in Washington, who are looking forward to a similarly facilitated movement in agricultural products. There is a growing belief that, barring unforeseen labor trouble and unusually bad weather conditions, the railroads will handle the transportation problem this fall and winter with more than ordinary smoothness, and with comparatively little or no inconvenience to industry. Should this eventuate, it has been pointed out, it will have a far-reaching effect on the railroads and the shipping community as a whole, especially the agricultural interests.

As is well known, all sorts of radical railroad legislation will be introduced at the next session of Congress but, if the railroads continue their present good showing in handling traffic and in netting fair returns, it is believed this will be the best possible specific to check railroad agitation by radicals in Congress. It is, of course, well known that President Coolidge would not approve radical legislation and that his veto power could prevent its enactment even in case such legislation passed Congress, although this in itself is not considered probable. Rather the apprehension shown relates to agitation and not to the likelihood of the passage of any wild legislation providing for Government ownership or operation of railroads, or other unsound proposals.

On July 31, the railroads had 76,453 surplus freight cars in good repair and immediately available for service, despite the record number of cars (1,041,044) loaded during the week ended July 28. The total number of surplus freight cars on July 31 was a decrease of 3257 compared with the number on July 22. Of the total on the former date, 57,831 were box cars and 6547 coal cars. At the same time, shortage in box cars totaled 9579, an increase since July 22 of 1679. The majority of the box cars shown as surplus are being held in the grain originating territories and will be used within the next two or three weeks as the grain movement becomes heavier. It is pointed out that the fact that there is no appreciable car shortage today should not serve as a basis for lessening efforts to move as much freight as possible before the fall period. The volume of traffic being handled is far in excess of that tonnage which it was anticipated would be offered the railroads.

Transverse Fissures in Rails Held Responsible for Accident

WASHINGTON, Aug. 14.—In a report announced today by the Interstate Commerce Commission concerning the derailment of a passenger train on July 13 on the Southern Railway at Larkinsville, Ala., the accident is attributed to a broken rail. The report of the bureau of safety of the commission says that examination of the rail showed that its failure was due to the presence of transverse fissures, these being discovered at four or five points at which the rail was fractured. The prevalence of the transverse fissures is attributed to the effect of the wheel loads introducing internal strains of tension in the head, which culminated in rupture of the rail in each of the several places where transverse fissures were disclosed. Tests showed, however, it is stated, that the quality of the steel was good. The track where the accident occurred was laid with 75-lb. rails.

Petition for Refund of Freight Charges on Ore

WASHINGTON, Aug. 14.—Iron ore interests have petitioned the Interstate Commerce Commission for a refund of charges collected under rates that were advanced while a former complaint in the so-called Adriatic Mining Co. case was pending. It will be recalled that the railroads in 1921 made an increase of 15 per cent in rates from the Gogebic and Marquette Ranges to Lake Superior ports. While the increases were protested the commission allowed them to go into effect but declared that its failure to suspend the rates was not an approval of the schedules.

Subsequently, the iron ore interests filed complaint against the rates and the applicants pointed out that in a supplementary complaint they asked for the keeping of an account of payments made under the increased rates and an order requiring refunds. It was stated also that at the hearing in Chicago they formally moved for an order, but upon assurance from the defendants that the keeping of accounts was unnecessary, the motion was withdrawn.

In its decision on the formal case the applicants point out, the commission said, that the increases were not warranted for the future and made an order requiring the rates to be reduced not later than June 1, 1923, and that the order was complied with on May 15 of the present year.

It is maintained that it is against the law to permit the railroads to retain the portions of the 1921 increases which were disapproved by the commission.

Steel from Illinois-Missouri Raw Materials

The monthly publication of the St. Louis Coke & Iron Co., Granite City, Ill., *Coke Breeze*, notes that on July 21 the company delivered to the National Enameling & Stamping Co.'s steel department the first basic pig iron made from materials all mined and shipped within a 100-mile radius of the Granite City and St. Louis industrial district. A half-tone illustration is given of the first plate rolled in the new plate mill of the National Enameling & Stamping Co. The pig iron from which the steel was made for this plate represents the use of 100 per cent Illinois coal and 100 per cent Missouri ore.

An important factor in the operations of the St. Louis Coke & Iron Co. is the new development under the direction of Leonard A. Busby, Chicago, at the historic Iron Mountain, Mo., mine. A concentrating plant has been built which is expected to have a daily output of 1000 tons of concentrates by Sept. 1, and ultimately a daily output of 2000 tons. A new shaft has been sunk to a depth of 329 ft., and most of the development work now under way is in ore.

Pacific Coast Steel Co. Expansion

Negotiations are under way which will result in due time in a very considerable expansion of the operations of the Pacific Coast Steel Co., San Francisco. The building of a modern blast furnace is included and sites have been under consideration, the choice being between South San Francisco and Long Beach, Cal. The city council of Long Beach has agreed to improve the harbor there to meet the requirements of the steel company, in case that district is selected. A statement made at San Francisco last week by D. E. McLaughlin, vice-president of the Pacific Coast Steel Co., indicated that several sites are in view for the new blast furnace, and that the new construction proposed by the company would ultimately require an outlay of more than $15,000,000.

Iron and Steel Markets

STARTING ON SHORT DAY

Added Cost Not Yet a Market Factor

Rail Prices Continue on 1924 Contracts—Steel Output Less

The change to the shorter workday that will be made this week at various Central Western iron and steel plants has had no traceable effect on orders or prices. Buyers show much interest in the new regime, particularly in the extent to which men can be had for the third shift because of lessened demand for steel. This factor cannot be measured today.

There is a similar lack of definite data on the increase in cost due to the employment of more men for a given output, but where detailed figures have been attempted they indicate that some estimates of the added cost have been high.

While the larger companies lead off in abolishing the 12-hour day, a good many of the smaller producers have made no plans. For some time their costs will be unchanged, and this is a competitive factor yet to be measured.

August started out with signs here and there of renewed buying of finished steel, but last week's observances brought quiet and thus far in the new week the demand has been for small amounts for specific purposes and for early delivery.

Encouragement is found in the volume of steel the railroads are taking for repair work and in the rail inquiries soon to come out for 1924. At Chicago pending business amounts to 90,000 tons, including 50,000 tons for the Norfolk & Western and a smaller tonnage for the Erie. Southwestern roads that were not expected to buy are also figuring, the Wabash wanting 10,000 tons.

The present rail price will apply on rails ordered for first quarter delivery, but the basis for second quarter contracts may not be fixed until late in the year.

Western steel plants apparently have the largest forward bookings on the heavier products. Youngstown and Pittsburgh plate, shape and bar mills, generally speaking, can make earlier deliveries than those at Chicago, while in plates particularly some Eastern mills could ship within a week or two.

The Steel Corporation's operating rate holds close to 90 per cent, with the prospect of maintaining that scale into the fall. The larger independents are nearer 80 per cent, while companies whose main output is one or two lines are at a somewhat less rate. Blast furnace shutdowns continue, and steel ingot output is at a less rate than in July.

Prices of all forms of finished steel are substantially those of recent weeks. At Buffalo plates for Canada sold at $2 a ton under the 2.50c. basis and at Pittsburgh a similar and usual concession was made on plates for a car plant.

In the fabricated steel field the long-expected buying of bridges is still awaited. Municipal and other public work is likewise in small volume. Of the 16,200 tons of awards, barely 1300 tons was for public undertakings and railroads did not figure in any.

Sales of 25,000 tons of pig iron are reported at Cleveland, chiefly foundry and malleable, and of 15,000 tons at Buffalo. In other districts there was a quieting down after recent activity. Prices showed no further decline, but it is not yet certain that merchant pig iron output has been cut down to the current rate of consumption. Foundry operations are quite well maintained in most districts, particularly in the East.

The report of recent buying of British pig iron for use in pipe works on the Eastern seaboard is without details except that the delivered price was close to $26. For several months British prices have not been competitive here.

A slight turn has come in the scrap market, which will be watched for its bearing on pig iron. At Pittsburgh open-hearth grades are $1 a ton higher. Coke, which for several months has kept pace with the decline in pig iron and scrap, shows more steadiness this week than at any time since April.

The Imperial Government Railways of Japan are in the market for 11,000 tons of 60-lb. and 75-lb. rails, with splice bars. A Belgian rail mill, which recently took a Japanese order at a low price, has now sold 10,000 tons to Argentina.

Welsh tin plate mills have sold several hundred thousand boxes of tin plate to the Far East for September-October delivery. July iron and steel exports from Great Britain were the smallest for the year at 307,000 tons, against 373,000 tons in June.

For the first time since early June there is no change this week in either THE IRON AGE composite price of finished steel or the pig iron composite. Steel remains at 2.775c. per lb. for the fourth successive week, while pig iron is $24.79 per gross ton.

Pittsburgh

Steel Orders Behind Shipments—Stronger Tone in Pig Iron—Scrap Higher

PITTSBURGH, Aug. 14.—Elimination of the 12-hr. work day in the steel industry, to be inaugurated this week by the Steel Corporation subsidiaries, now claims the attention of the trade for its probable effect upon output and prices. It is generally held that the change means a lower rate of production and higher costs, since the creation of an extra crew of workmen will be possible in many cases only by the closing down of some producing units. The actual increase in costs, however, can hardly be ascertained until the plant is in full operation and has been given a fair test, and such is not immediately possible in view of the fact that only a few of the independent steel companies in

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

For Early Delivery

Pig Iron, Per Gross Ton:	Aug. 14, 1923	Aug. 7, 1923	July 17, 1923	Aug. 15, 1922
No. 2X, Philadelphia‡	$25.76	$25.76	$27.56	$33.14
No. 2, Valley furnace†	**25.00**	24.00	25.00	30.00
No. 2, Southern, Cin'ti†	*27.55*	28.05	29.05	24.05
No. 2, Birmingham, Ala.†	24.00	24.00	25.00	19.50
No. 2 foundry, Chicago*	27.00	27.00	28.00	30.00
Basic, del'd, eastern Pa.	25.00	25.00	26.50	27.25
Basic, Valley furnace	24.50	24.50	25.00	26.00
Valley Bessemer, del. P'gh	28.26	28.26	28.26	28.76
Malleable, Chicago*	27.00	27.00	28.00	30.00
Malleable, Valley	24.50	24.50	25.50	28.00
Gray forge, Pittsburgh	25.76	25.76	26.26	30.00
L. S. charcoal, Chicago	32.15	32.15	36.65	33.15
Ferromanganese, furnace	117.50	117.50	117.50	67.50
Rails, Billets, Etc., Per Gross Ton:				
O.-h. rails, heavy, at mill	$43.00	$43.00	$43.00	$40.00
Bess. billets, Pittsburgh	42.50	42.50	42.50	35.00
O.-h. billets, Pittsburgh	42.50	42.50	42.50	35.00
O.-h. sheet bars, P'gh	42.50	42.50	42.50	35.00
Forging billets, base, P'gh	47.50	47.50	47.50	40.00
O.-h. billets, Phila.	47.67	47.67	47.67	42.67
Wire rods, Pittsburgh	51.00	51.00	51.00	42.00
	Cents	Cents	Cents	Cents
Skelp, gr. steel, P'gh, lb.	2.40	2.40	2.40	2.00
Light rails at mill	2.25	2.25	2.25	1.90
Finished Iron and Steel,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Iron bars, Philadelphia	2.67	2.67	2.67	2.325
Iron bars, Chicago	2.40	2.40	2.50	2.15
Steel bars, Pittsburgh	2.40	2.40	2.40	1.90
Steel bars, Chicago	2.60	2.60	2.60	1.90
Steel bars, New York	2.74	2.74	2.74	2.24
Tank plates, Pittsburgh	2.50	2.50	2.50	1.90
Tank plates, Chicago	2.80	2.80	2.80	1.90
Tank plates, New York	2.84	2.84	2.84	2.34
Beams, Pittsburgh	2.50	2.50	2.50	1.90
Beams, Chicago	2.70	2.70	2.70	1.90
Beams, New York	2.84	2.84	2.84	2.24
Steel hoops, Pittsburgh	3.15	3.15	3.15	2.50

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.
†Silicon, 1.75 to 2.25. ‡Silicon, 2.25 to 2.75.

Sheets, Nails and Wire,	Aug. 14, 1923	Aug. 7, 1923	July 17, 1923	Aug. 15, 1922
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 28, P'gh	3.75	3.75	3.85	3.15
Sheets, galv., No. 28, P'gh	5.00	5.00	5.00	4.15
Sheets, blue an'l'd, 9 & 10	3.00	3.00	3.00	2.40
Wire nails, Pittsburgh	3.00	3.00	3.00	2.40
Plain wire, Pittsburgh	2.75	2.75	2.75	2.25
Barbed wire, galv., P'gh	3.80	3.80	3.80	3.05
Tin plate, 100-lb. box, P'gh	$5.50	$5.50	$5.50	$4.75
Old Material, Per Gross Ton:				
Carwheels, Chicago	$19.50	$19.50	$20.50	$20.50
Carwheels, Philadelphia	20.00	20.00	20.00	17.50
Heavy steel scrap, P'gh	**18.00**	17.00	18.00	17.50
Heavy steel scrap, Phila.	**16.00**	15.50	16.50	15.00
Heavy steel scrap, Ch'go	16.00	16.00	17.00	15.75
No. 1 cast, Pittsburgh	**21.50**	20.00	21.00	19.00
No. 1 cast, Philadelphia	20.00	20.00	21.50	19.00
No. 1 cast, Ch'go (net ton)	*17.50*	18.50	19.00	18.50
No. 1 RR. wrot., Phila.	18.00	18.00	18.00	18.00
No. 1 RR. wrot., Ch'go (net)	14.00	14.00	14.50	14.50
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$4.50	$4.50	$4.50	$14.00
Foundry coke, prompt	5.25	5.25	5.25	15.00
Metals				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	*14.50*	14.75	15.00	14.12½
Electrolytic copper, refinery	*13.87½*	14.12½	14.50	13.75
Zinc, St. Louis	**6.25**	6.15	6.12½	6.15
Zinc, New York	**6.60**	6.50	6.47½	6.50
Lead, St. Louis	*6.35*	6.62½	5.90	5.55
Lead, New York	*6.70*	6.75	6.00	5.90
Tin (Straits), New York	**38.50**	38.37½	38.00	32.12½
Antimony (Asiatic), N. Y.	**7.87½**	7.60	6.85	5.25

The prices in the above table are for domestic delivery and do not necessarily apply to export business.

Composite Price Aug. 14, 1923, Finished Steel, 2.775c. Per lb.

Based on prices of steel bars, beams, tank plates, plain wire, open-hearth rails, black pipe and black sheets

These products constitute 88 per cent of the United States output of finished steel

Aug. 7, 1923,	2.775c.
July 17, 1923,	2.789c.
Aug. 15, 1922,	2.255c.
10-year pre-war average,	1.689c.

Composite Price Aug. 14, 1923, Pig Iron, $24.79 Per Gross Ton

Based on average of basic and foundry irons, the basic being Valley quotation, the foundry an average of Chicago, Philadelphia and Birmingham

Aug. 7, 1923,	$24.79
July 17, 1923,	25.93
Aug. 15, 1922,	26.77
10-year pre-war average,	15.72

this and nearby districts yet have formulated a plan of action or decided upon a date for the introduction of the change. That is also the condition with many of the merchant producers of pig iron, who find that the men do not welcome the idea of exchanging a lower daily wage for a shorter work day and consequently are moving slowly in the adoption of a change in the working schedules.

Market-wise, the situation has been productive of little change. Orders for finished steel in practically all lines are running behind the shipments, and, while the gap here and there has been narrowed by a falling off in shipments, it is well established that order books steadily are dwindling in size. Inquiry is by no means absent, and there are fairly frequent requests for information as to how prices will be affected by the elimination of the long work day in continuously operated departments, but the demand is chiefly for small tonnages and usually for a specific purpose and for a specific delivery. Such business being easily filled, it does not add much to mill obligations. There are few mills which do not need business, particularly for delivery in the last quarter of the year, but any tendency actively to seek business is checked by the belief that this might produce lower prices just about the time that costs are moving in the other direction as a result of the change in working hours at the blast furnace, coke ovens, and open-hearth furnaces.

A slightly stronger tone is apparent in the pig-iron market, but this development reflects no important change in fundamental conditions, but rather that producers more generally take the position that they should not sell below costs. Demand shows no decided betterment, and supplies still are more than ample for requirements. We also note a stronger market in scrap, which is at least $1 a ton higher on the open-hearth grades on moderate purchases by melters and also because of a decline in offerings at recent prices. Coke production having been pretty well balanced with consumption, the market shows more real steadiness now than has been evident before since early April.

Change of working schedules will probably mean some reduction in the steel output of the Steel Corporation subsidiaries, but the change not applying very generally with independents, the week's total ingot production probably will show only a trifling decrease from that of last week. The Pittsburgh Crucible Steel Co. late last week banked its No. 3 furnace at

Midland, Pa. The stack of the Clinton Iron & Steel Co., Pittsburgh, will cease making pig iron this week. These are the only definite changes in the blast furnace list, and will leave 112 furnaces in this and nearby districts in production, two banked and 24 cold.

Pig Iron.—Consumers still are pursuing a hand-to-mouth policy in the matter of purchases, and while the week's business reaches a fair-sized total, it has been made up largely of small individual tonnages. Evidently $24, Valley furnace, no longer can be done on basic and foundry iron, as on such business as has been done in the week under review in those grades the price has been $25 minimum on foundry and not less than that price on basic. The Edgewater Steel Co., Edgewater, Pa., has covered against its recent inquiry for 2000 tons of basic and is understood to have paid $25, Valley furnace. The Pittsburgh Steel Foundry Co. was able to secure about 750 tons of this grade at a delivered price of slightly above $26, equivalent to less than $24.50 at Valley furnace, but the iron comes from a producer having a freight rate of 60c. to the consumer's plant. Another purchase of 2000 tons of basic at $25, Valley furnace, has been made by a producer whose present output is not sufficient to meet obligations. Only pickup tonnages of Bessemer iron have been sold and these all have gone at the former price of $26.50, Valley furnace. Sales of foundry iron for the week probably total around 2000 tons, made up of many sales of small tonnages. The lowest price done, even by middle interests, was $25, Valley furnace, for No. 2, and some producers claim to have made sales at $26 for the base grade. The Warren Tool & Forge Co., Warren, Ohio, was able to cover the 1000 tons of malleable iron it inquired for recently at $24, Valley furnace, basis. Such business as has been done here lately in low phosphorus iron has gone to an Eastern interest whose price is $28 at furnace, or $33.42, delivered Pittsburgh. The Valley maker of this grade has further reduced his price to $32.

We quote Valley furnace, the freight rate for delivery to the Cleveland or Pittsburgh district being $1.76 per gross ton:

Basic	$24.50 to $25.00
Bessemer	26.50
Gray forge	24.50 to 25.50
No. 2 foundry	25.00 to 26.00
No. 3 foundry	24.50 to 25.50
Malleable	24.50 to 25.50
Low phosphorus, copper free (nominal)	32.00

Ferroalloys.—Business is practically at a standstill, and prices are stationary because there is not enough doing on which to establish a change. Consumers generally are well protected against their requirements over the remainder of the year. Ferromanganese still is priced at $117.50, furnace or seaboard, with freight to Pittsburgh equalized, but it is doubtful if that price now could be obtained, except on small lots, since resale material has been offered round pretty freely as low as $111.50, without takers. Prices are given on page 443.

Semi-Finished Steel.—Open market activities still are limited and quotations merely are those which have been named on contract tonnages for the present quarter. It is pretty generally believed that any consumer who could use a round lot of billets, sheet bars or slabs would be able to buy at less than quotations, but nobody seems to have a need for more material than is being delivered on contracts, and producers naturally are not disposed to force sales. The market is entirely untested on these forms, and as there has been only a trifling decline in ingot production in the past 30 days, while non-integrated mills have in few instances specified fully their quotas, there is no question but that there has been some accumulation of steel at producing plants. Forging billets are hard to move, even at $47.50. Rods also are slow, although a couple of sales of coarse rods, amounting to a few hundred tons, have been made at the full price of $51, base. There have been no further sales of skelp since the recent purchase of the National Tube Co., in which a local independent, as well as one in Youngstown, participated. Prices are given on page 443.

Wire Products.—Makers here report excellent specifications against nail orders and state that buyers are not lying down on their wire orders, but business otherwise is pretty flat. The farmers are afield these days and have no time for building fences; this is reflected in the demand for barbed wire, staples, and woven fence. The trade is hopeful of a change for the better in these products in the next 30 days, but admit that present prices of farm products do not indicate very strong buying power among the farmers. There is no change in prices, but most makers now want business and promise fairly prompt deliveries, which contrasts strongly with the condition of a few weeks ago, when getting on mill books was akin to a favor. Prices are given on page 442.

Steel Rails.—Light rails rolled from old standard sections are said to have been offered as low as 1.90c., base, mill, but makers here rolling these sections from new billets or standard rail crops, still insist they are not shading the former base of 2.25c. Inquiries for light rails are more numerous than they were recently, but actual orders do not show a corresponding gain.

We quote light rails rolled from new steel at 2.25c. base (25-lb. to 45-lb.); those rolled from old rails, 1.90c. to 2c. base (12-lb. to 45-lb.), f.o.b. mill; standard rails, $43 per gross ton mill, for Bessemer and open-hearth sections.

Tubular Goods.—It is the experience of most makers of steel pipe that there is a steady depletion of order books. This is especially true of lap-welded goods, in which there has been a considerable advancing of delivery promises. The most encouraging feature of the steel pipe business today is heavy consumption, as indicated by shipments, rather than by new business, which generally is not as good as it was last month. One independent interest, which had a card based slightly above that of other makers, recently withdrew its card and put its prices on the bases of other producers. Wrought-iron pipe makers are well caught up with their obligations and making very prompt deliveries on new business. Boiler tube specifications hold up well, but new business is light. Discounts are given on page 442.

Cold-Finished Steel Bars and Shafting.—A few fair-sized orders lately have appeared from the agricultural implement manufacturers, but otherwise business still is quiet both as regards orders and specifications, chiefly because the between seasons' slowing up of the automotive industry is not yet over. The established base of 3.25c. is well observed; makers cannot well shade that price in the face of higher costs of hot-rolled bars introduced through increased extras, but at the same time, it is admitted that these increases in extras are not sufficient to warrant higher prices for cold-finished bars. Ground shafting holds at 3.65c., base, f.o.b., mill.

Hot-Rolled Flats.—Recent downward revision of prices does not seem to have materially stimulated the demand, at least not in strips which, on account of the between seasons' period in the automotive industry, are moving slowly. The fact that some mills will take business in strips in competition with skelp or blue annealed sheets at 3c., base, also is a deterrent to orders. The "official" price now is 3.15c. on hoops, all gages and widths, bands and strips, but concessions probably are obtainable on all three products. Prices are given on page 442.

Cold-Rolled Strips.—All makers now are on a base of 5c., Pittsburgh, on this product and, despite the weakness in hot-rolled strips, there is fairly strict observance of that price.

Bolts, Nuts and Rivets.—A slightly stronger tendency is noted, but it is due less to an increase in the demand than to the fact that makers, in checking up the effect of the increased extras for size, cutting, etc., in hot-rolled bars, find present prices to be badly out of line with probable costs. It is learned that large producers are working on a new list of discounts, which is expected to become effective Sept. 1, and which will advance many sizes of bolts, nuts and rivets to take up the increased costs involved in the recently adopted extras on bars. Business is not materially better than it has been, but pressure to

sell is less heavy. Prices and discounts are given on page 443.

Track Fastenings. — Independent manufacturers lately have fallen in line with the American Steel & Wire Co. on the price of small railroad spikes, which now are generally quoted at $3.50, base, per 100 lb. Makers are not very well supplied with orders for small spikes, but have fair order books in the other sizes and in tie plates. New demands locally are few and small. Prices are given on page 443.

Alloy Steel Bars.—Demand is extremely light, in keeping with conditions in the automotive industry. There is some anxiety on the part of producers for business and it is no secret that, on attractive inquiries, quotations have been shaded as much as $5 per ton. Prices are given on page 443.

Iron and Steel Bars.—Real activity is lacking in steel bars, but pressure for business, even on the part of mills with light order books, is not heavy, and the regular market price of 2.40c., base, Pittsburgh, is closely observed. That price, however, carries very prompt delivery from a number of mills. A marked slowing up in the demand does not seem to weaken the price ideas or bar iron makers here.

We quote soft steel bars, rolled from billets, at 2.40c. base; bars for cold-finishing of screw stock analysis, $3 per ton over base; reinforcing bars, rolled from billets, 2.40c. base; refined iron bars, 3.25c. base, in carload lots or more f.o.b. Pittsburgh.

Structural Material.—Some increase in inquiries is observed, but not on the part of local fabricators, who lately have been getting new orders in very much reduced volume by comparison with completed jobs. It is no longer difficult to get on mill books for reasonably early delivery at the published quotation. Structural steel interests, however, hesitate to stock material at today's price, since their experience in quoting on new projects has disclosed that they cannot obtain awards on the basis of current plain material quotations. Most of the big projects in this district are dormant at present. Plain material prices are given on page 442.

Plates.—A relatively good demand upon mills continues, but it comes more from outside than from within the immediate district and finds its origin chiefly in the numerous oil storage tank inquiries now current. The Dravo Contracting Co., Pittsburgh, has been awarded 14 120-ft. barges by the Mississippi River Commission, for which about 1600 tons of plates and small shapes will be required, and six dump scows by the U. S. Engineers' office, Louisville, Ky., taking about 725 tons of steel. A local car builder recently bought and interest in fourth quarter tonnages seems to be mean no weakening in the price, since such consumers usually have a preferential price of $2 per ton below the accepted market price. Prices are given on page 442.

Sheets.—Specifications against old orders are fairly free, but new demands are moderate in the extreme and interest in fourth quarter tonnages seem to be chiefly as to prices, which some seem to think may be affected by the change in working hours in steel plants. The elimination of the 12-hr. day means little in the sheet mills, where the 8-hr. day has been in vogue so long that it is now an institution. Sheet prices are holding well, save in the case of black sheets, and even they are not publicly quoted under 3.85c. base. As low as 3.75c. base is being developed by definite offers and there are several mills which want prompt shipment business badly enough to take it at that price. Prices are given on page 442.

Tin Plate.—Ordinarily, prices for fourth quarter business should be out this week, since tomorrow is the day that specifications should be placed for October shipments. Present obligations of mills, however, will carry them into October and the matter of prices is being left for future adjustment. Production has been picking up lately, but shipments have not been sufficiently better to reduce the pressure of can makers for supplies.

Coke and Coal.—Demand for furnace coke is far from heavy, but is more nearly equal to the supply than it was recently, owing to continued curtailment of production, and the market now is quite steady at the basis of a week ago of $4.50 per net ton at ovens. Occasional sales are reported at $4.75, but it is not yet necessary to go that high except for small lots of special brands. Most producers have set $5 as their idea of last quarter contract tonnages. Spot foundry coke holds at $5.25 to $5.75. The coal market has been helped by an increased demand for domestic purposes. Pittsburgh steam coal now is selling at $2 to $2.10 per net ton at mines for mine run, with coking coal at $2.25 to $2.35 and gas grade at $2.40 to $2.50. With a number of mines in this district idle competition for orders is not as keen as it was recently.

Old Material.—The market has developed a much stronger tendency since last accounts, due partly to some fair-sized purchases by one of the Steel Corporation subsidiaries, which has taken a round lot of No. 1, railroad heavy melting grade, at $19, and sales to a West Virginia steel company of good heavy melting at $18. We now regard the market on this material at $18 to $19; certainly, recent efforts by both dealers and melters to secure tonnages at less than $18 have been futile. Scrap collectors are disposed to throw the material down and hold for higher prices, and it is believed railroad lists from now on will be smaller. Several steel makers are feeling out the market and there continues to be a well-sustained demand for the better grades from the steel foundries. Strength in these directions is toning up the market on the other grades. Through a typographical error, the maximum price on bundled sheet sides and ends last week was given as $15.50; it should have been $15. Norfolk & Western Railway will receive bids until noon, Aug. 15, on about 19,100 gross tons of scrap.

We quote for delivery to consumers' mill in the Pittsburgh and other districts taking the Pittsburgh freight rate as follows:

Per Gross Ton	
Heavy melting steel	$18.00 to $19.00
No. 1 cast, cupola size	21.50 to 22.00
Rails for rolling, Newark and Cambridge, Ohio; Cumberland, Md.; Huntington, W. Va., and Franklin, Pa.	19.00 to 20.00
Compressed sheet steel	16.00 to 16.50
Bundles, sheets, sides and ends	15.00 to 15.50
Railroad knuckles and couplers	21.50 to 22.00
Railroad coil and leaf springs	21.50 to 22.00
Low phosphorus bloom and billet ends	23.50 to 24.00
Low phosphorus plate and other material	22.50 to 23.00
Railroad malleable	20.00 to 20.50
Steel car axles	21.00 to 21.50
Cast iron wheels	18.50 to 19.00
Rolled steel wheels	21.50 to 22.00
Machine shop turnings	11.50 to 12.00
Sheet bar crops	21.00 to 21.50
Heavy steel axle turnings	14.50 to 15.00
Short shoveling turnings	13.50 to 14.00
Heavy breakable cast	17.50 to 18.00
Stove plate	15.00 to 15.50
Cast iron borings	13.50 to 14.00
No. 1 railroad wrought	14.00 to 14.50
No. 2 railroad wrought	18.00 to 18.50

The Austrian Steel Industry

The Austrian iron and steel industry was very productive during May, the output of the Alpine Montangesellschaft exceeding that of any other month in 1923. Large orders for pig iron, ingots, steel bars and joints, mostly for export to Germany, were filled. The outlook for the immediate future is uncertain, however. Prices were reduced during May from 10 to 21 per cent, the greatest reductions being in the more highly manufactured products, Assistant Trade Commissioner E. M. Zwickel, Vienna, reports.

Ruhr Occupation Affects Swedish Ore Exports

For the first four and a half months of 1923 the Swedish iron ore exports were about 50 per cent normal. In the past about 65 per cent of the total Swedish ore has been exported to Westphalia, but the Ruhr occupation has closed this market. Shipments to all other countries have increased during 1923, especially those to the United States and Canada. The Swedish pig iron production has been lower than at any time since 1912, according to a report from Charge d'Affaires Johnson at Stockholm.

Chicago

Interest Developing in Fourth Quarter Steel Needs—Fair Pig Iron Business

CHICAGO, Aug. 14.—The market has passed through a quiet week, attributable in part at least to the cessation of business during the obsequies for the late President. Buying keeps up at the same restricted pace which has prevailed for the past three months, although it is to be noted that consumers generally are commencing to show interest in their fourth quarter requirements. The Inland Steel Co., which has been quoting 2.60c., 2.70c. and 2.80c., Chicago, respectively for bars, shapes and plates, expects to announce its fourth quarter prices soon. The Illinois Steel Co. continues to name 2.50c. on bars and 2.60c. on plates and shapes for delivery at mills' convenience.

While it is believed that the increased operating costs involved in the elimination of the 12-hr. day will eventually be passed on to the consumer, there have been no intimations that an immediate advance in prices is contemplated. There continues to be shading in sheets and bar iron is weak. Demand for rail steel bars is very slack and mills are taking advantage of the lull to shut down for repairs. The operations of blast furnaces and steel works remain substantially unchanged.

[In the introduction to this market in THE IRON AGE of Aug. 2, reference was made to the wheat crop in its relation to all agricultural products. The insertion of the word "wheat" instead of "wealth" in the following sentence seriously changed the meaning: "The value of the wheat harvested in 1922 was only 10 per cent of the total crops of American farmers, and barely 6 per cent of the total *wealth* produced by them in that year."]

Ferroalloys.—Scattering carload sales of spiegeleisen totaling about 200 tons have been made at the full market price. An inquiry from a local buyer calls for 50 tons of ferromanganese.

We quote 80 per cent ferromanganese, $125.06 to $125.88 for all deliveries; 50 per cent ferrosilicon, $88 to $90, delivered; spiegeleisen, 18 to 22 per cent, $53.58, delivered.

Pig Iron.—Demand has subsided again after the spurt of a week ago, but there is still a fair amount of business pending. Orders recently taken involve small lots but they were in such considerable number as to indicate that melters are running short of iron and are in imperative need of new supplies. Even those who bought as much as 500 or 1000 tons for delivery this quarter did not in most cases purchase their full requirements. There was also some business closed for fourth quarter delivery and one sizable inquiry called for shipment during the first quarter of 1924. New inquiries continue to make their appearance, although they are not so numerous as a week ago. Pending business in Milwaukee, consisting largely of small lots, totals fully 900 tons. Local iron is steady at a minimum of $27 base, furnace, and this price also appears to be the maximum figure on current sales. A local melter has closed for 500 tons of foundry iron for fourth quarter at that price. In central Michigan Cleveland iron has competed successfully with the Chicago, Detroit and Toledo products and in the northern part of the southern peninsula of that State Canadian iron in the high silicon analysis has been laid down at lower prices than those named by other furnaces. We note a sale of 700 tons of Canadian foundry iron to a user in the northern part of southern Michigan. An implement manufacturer in the Tri-cities has purchased 1000 tons of foundry for September to December delivery from St. Louis and Southern furnaces. The lowest Southern quotation reported is $23, base Birmingham. Sales of a total of 600 tons of silvery iron have been negotiated in Michigan at the full Jackson County schedule. A local melter has closed for 400 tons of low phosphorus iron. A steel works has bought 500 tons of 10 per cent Bessemer ferrosilicon.

Quotations on Northern foundry high phosphorus malleable and basic irons are f.o.b. local furnace and do not include an average switching charge of 61c. per ton. Other prices are for iron delivered at consumers' yards or when so indicated, f.o.b. furnace other than local.

Lake Superior charcoal, averaging sil. 1.50, delivered at Chicago	$32.04 to $32.15
Northern coke, No. 1, sil. 2.25 to 2.75	27.50 to 28.00
Northern coke, foundry No. 2, sil. 1.75 to 2.25	27.00 to 27.50
Malleable, not over 2.25 sil.	27.00 to 27.50
Basic	27.00 to 27.50
High phosphorus	27.00 to 27.50
Southern No. 2	30.01 to 31.01
Low phos., sil. 1 to 2 per cent, copper free	34.00 to 35.00
Silvery, sil. 8 per cent	39.29

Plates.—Demand continues light, although some consumers are commencing to show interest in their fourth quarter needs. Mills east of here which are quoting 2.50c., base, Pittsburgh, are offering very expeditious deliveries, from 10 days to 3 weeks' shipments not being uncommon. The local mill situation is substantially unchanged. The Inland Steel Co., which has been quoting 2.80c., Chicago, on tank plates, will soon announce fourth quarter prices on all of its finished products. The Illinois Steel Co. continues to quote 2.60c. on plates for delivery at mills' convenience. No new oil storage tank awards have been reported, but additional business is said to be in prospect. Thirty tanks recently booked by the Chicago Bridge & Iron Works from the Sinclair Crude Oil Purchasing Co. will involve 10,500 tons of plates instead of 9000 tons, as first announced. The Sinclair interests are still figuring on tanks requiring 14,000 tons additional.

The mill quotation is 2.60c. to 2.80c., Chicago. Jobbers quote 3.30c. for plates out of stock.

Cast-Iron Pipe.—Ecorse, Mich., has let a general contract to T. C. Brooks & Sons Co., Jackson, Mich., for 890 tons, which, it is understood, will be furnished by the American Cast Iron Pipe Co. The Superintendent of the Poor, Wayne County, Eloise, Mich., takes bids Aug. 15 on 160 tons of 4, 6 and 8-in. water pipe. Cleveland took bids Aug. 11 on 1000 tons of 24-in. pipe. Although the market is quiet, pipe shops are still behind on deliveries of the smaller sizes and prices are correspondingly firm.

We quote per net ton, f.o.b. Chicago, as follows: Water pipe, 4-in., $64.20; 6-in. to 12-in., $60.20; above 12-in., $57.20 to $59.20; class A and gas pipe, $5 extra.

Sheets.—Concessions of $1 to $2 a ton continue to be made on black and galvanized sheets, but blue annealed is firm. As would be expected, demand for blue annealed is better than for the other two classes of sheets. The market, as a whole, remains quiet, however, the only inquiries of note being from Japan for delivery before the first of the year. An inquiry from that country received during the current week calls for 3000 tons of light black sheets.

Mill quotations are 3.85c. for No. 28 black, 3c. for No. 10 blue annealed and 5c. for No. 28 galvanized, all being Pittsburgh prices, subject to a freight rate to Chicago of 34c. per 100 lb.
Jobbers quote f.o.b. Chicago, 4.35c. for blue annealed, 5.20c. for black and 6.35c. for galvanized.

Structural Material.—Structural lettings and inquiries are few, but fabricators are still fairly busy on old business. Plans for the Ford Motor Co. plant at St. Paul, Minn., are being revised; the original specifications on which bids had been taken called for over 10,000 tons.

The mill quotation on plain material is 2.60c. to 2.70c., Chicago. Jobbers quote 3.30c. for plain material out of warehouse.

Bars.—Demand for soft steel bars is somewhat better than for plates or shapes, although business during the past week was adversely affected by the suspension of trade during the funeral of the late President. Automobile builders are coming into the market rather actively for material for their new models, demand for which is heavier than they expected. However, the trade does not look for as heavy an output of motor cars during the last half of the year as in the

six months' period just completed. The farm implement industry is passing through its dull season, but it does not look forward to the fall with any great degree of confidence. While buying of soft steel bars is still in small volume, consumers generally are commencing to feel out the market on their fourth quarter requirements. In most cases their stocks are low and for this reason mills expect them to place orders in the near future. Demand for hard steel bars is very light, although prices are unchanged. The plant of the Inland Steel Co. at Chicago Heights will be down for repairs until Aug. 26, and it is probable that two other rail steel bar mills will also shut down. Bar iron is weak and concessions have brought out some business. Few, if any, orders are being placed at over 2.40c., mill.

Mill prices are: Mild steel bars, 2.50c. to 2.60c., Chicago; common bar iron, 2.40c., Chicago; rail steel, 2.30c., Chicago mill.

Jobbers quote 3.20c. for steel bars out of warehouse. The warehouse quotation on cold-rolled steel bars and shafting is 4.55c. for rounds and 5.05c. for flats, squares and hexagons.

Jobbers quote hard and medium deformed steel bars at 3c. base; hoops, 4.55c; bands, 3.95c.

Wire Products. — Specifications are somewhat heavier and the receipt of a number of rush orders for barbed wire is regarded as a good indication. A full-fledged fall demand, however, has not yet made its appearance. Deliveries from the mills are now fairly prompt on all products. For mill prices, see Finished Iron and Steel, f.o.b. Pittsburgh, page 442.

We quote warehouse prices f.o.b. Chicago: No. 6 to No. 9 bright basic wire, $3.90 per 100 lb.; extra for black annealed wire, 15c. per 100 lb.; common wire nails, $3.80 per 100 lb.; cement coated nails, $3.25 per keg.

Rails and Track Supplies.—The Japanese Government is inquiring for 15,000 tons of rails and 1200 tons of angle bars for delivery before the close of the year. Local mills have booked orders for about 3000 tons of rails from frog and switch manufacturers. Pending inquiries from domestic railroads for rails total 90,000 tons, including 50,000 tons for the Norfolk & Western, a round tonnage for the Erie and the remainder for Western lines. The mills have not yet announced their rail price for 1924, and until they do so no general buying movement for that delivery can get under way. In the meantime the railroads are pressing the mills hard for shipments of rails and fastenings against their contracts.

Standard Bessemer and open-hearth rails, $43; light rails, rolled steel, 2.25c., f.o.b. makers' mills.

Standard railroad spikes, 3.25c. mill; track bolts with square nuts, 4.25c. mill; iron tie plates, 2.85c. mill; steel tie plates, 2.60c., f.o.b. mill; angle bars, 2.75c., f.o.b. mill.

Jobbers quote standard spikes out of warehouse at 3.90c. base and track bolts 4.90c. base.

Reinforcing Bars.—New bookings of dealers are still light as compared with the tonnage taken earlier in the year, but are nevertheless considered satisfactory for this season. There is considerable business pending, however, the largest individual project being 6250 tons for the North Side sewage treatment plant of the Sanitary District, Chicago. The general contract for this work has been let to the John Griffiths & Son Co., Chicago, and the placing of the bars is expected soon. Prices are unchanged at 3c. Chicago warehouse. Awards include:

Ford Motor Co., hydro-electric plant, St. Paul, Minn., 250 tons, to the Kansas City Bolt & Nut Co.

Road work, Grand Forks, Minn., 125 tons, to C. A. P. Turner Co.

Garage for P. C. Winn at 1217-31 Lawrence Avenue, Chicago, 200 tons, to Kalman Steel Co.

Stratford Arms Hotel, Detroit, Mich., 150 tons, to McRae Steel Co.

City of Chicago, bridges over Chicago River at California Avenue and Adams Street, 360 tons, to Truscon Steel Co.

Pending business includes:

St. Paul, Minn., water department, Mississippi River conduit, 500 tons.

University of Iowa, recitation building, Iowa City, 200 tons.

South Park Commissioners, Chicago, viaduct at Twenty-third Street and Illinois Central tracks, 150 tons, general contract awarded.

Fair Store addition, Chicago, 400 tons.

Old Material.—The market is still soft and there have been a few additional declines, although here and there a grade of scrap is commencing to show some signs of firmness. Short rails and frogs, switches and guards, for example, appear to be 50c. higher than a week ago. Demand for these grades has developed and supply has been found none too ample. Generally speaking, however, there is little interest in the market on the part of users. Activity is confined largely to dealers and there is a considerable demand for car numbers to apply against orders expiring this month. Although railroad offerings have been large, deliveries from them are said to be unusually slow. The Northern Pacific advertises 2300 tons; the Great Northern, 2500 tons; the Wabash, 2600 tons; the Texas & Pacific, 1700 tons; the Canadian National Railways, 1500 tons, and the Soo Line, 1000 tons.

We quote delivery in consumers' yards, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton	
Iron rails	$21.00 to $21.50
Cast iron car wheels	19.50 to 20.00
Relaying rails, 56 and 60 lb.	28.50 to 29.50
Relaying rails, 65 lb. and heavier	32.00 to 35.00
Rolled or forged steel car wheels	20.00 to 20.50
Rails for rolling	17.50 to 18.00
Steel rails, less than 3 ft.	19.50 to 20.00
Heavy melting steel	16.00 to 16.50
Frogs, switches and guards cut apart	16.50 to 17.00
Shoveling steel	15.75 to 16.25
Drop forge flashings	10.00 to 10.50
Hydraulic compressed sheets	12.50 to 13.00
Axle turnings	13.00 to 13.50
Steel angle bars	17.25 to 17.75
Per Net Ton	
Iron angle and splice bars	22.00 to 22.50
Iron arch bars and transoms	22.00 to 22.50
Iron car axles	25.50 to 26.00
Steel car axles	17.00 to 17.50
No. 1 busheling	12.50 to 13.00
No. 2 busheling	9.00 to 9.50
Cut forge	14.25 to 14.75
Pipes and flues	9.50 to 10.00
No. 1 railroad wrought	14.00 to 14.50
No. 2 railroad wrought	14.25 to 14.75
Steel knuckles and couplers	18.50 to 19.00
Coil springs	19.00 to 19.50
No. 1 machinery cast	17.50 to 18.50
No. 1 railroad cast	17.00 to 17.50
No. 1 agricultural cast	17.00 to 17.50
Low phos. punchings	16.00 to 16.50
Locomotive tires, smooth	15.00 to 15.50
Machine shop turnings	8.00 to 8.50
Cast borings	11.00 to 11.50
Short shoveling turnings	11.00 to 11.50
Stove plate	14.50 to 15.00
Grate bars	12.75 to 13.00
Brake shoes	14.00 to 14.50
Railroad malleable	18.00 to 18.50
Agricultural malleable	16.50 to 17.00

Portugal Needs Steel Products

American metallurgical companies have a fertile field in Portugal, according to a report to the Department of Commerce from Consul W. S. Hollis, Lisbon, for the introduction and sale of rails, railway material, plates, angle iron, beams, piping, tin plate, wire, etc., especially for the exploitation of the Wolfram mines for which this country is noted. Tin plate is one of the biggest items of import through the port of Lisbon, a total of 90,541 boxes being imported from England during 1922. No tin plate was imported in America during that year, but it is believed that American manufacturers would do well to contest this trade during 1923.

Operations in Czecho-Slovakia

Current reports from Czecho-Slovakia received by the Department of Commerce, indicate no important change in the activity of the local iron and steel mills which are continuing to operate around 45 per cent of capacity as for two or three months past, with production on a basis of approximately 850,000 metric tons of steel annually. Of this quantity about 25 per cent is used in the domestic market and the remainder is exported to Germany in particular. Orders for export are declining and prices, while still unchanged, are showing a soft tendency. It is estimated that orders now on hand will keep the mills occupied until next August.

New York

Foundry Operations Well Maintained—New Structural Inquiries

NEW YORK, Aug. 14.—While the national observances of last week affected all markets, quite a number of new pig iron inquiries are now before New York sellers, the aggregate being 3000 to 4000 tons. Reports agree that foundry operations are holding up well in Eastern territory, and there are cases in which output is being increased. From the number and character of inquiries now coming in, it is inferred that a good deal of pig iron is yet to be bought for September delivery. Larger consumers as a rule are covered for the present. Inquiries that are new this week range from a few carloads up to 500 tons, including 500 tons, 200 tons and two lots of 100 tons for Connecticut delivery; 500 tons of No. 1 foundry for a New Jersey plant; 200 tons for eastern New York State delivery; 300 tons for a New Jersey foundry, with phosphorus specification below the usual. There is also a Canadian inquiry for 200 tons. Apparently the $25 basis is rather more firmly maintained than has been the case recently.

We quote delivered in the New York district as follows, having added to furnace prices $2.27 freight from eastern Pennsylvania, $4.91 from Buffalo and $5.44 from Virginia:

East. Pa. No. 1X fdy., sil. 2.75 to 3.25	$27.77
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	27.27
East. Pa. No. 2, sil. 1.75 to 2.25	$27.02 to 27.27
Buffalo, sil. 1.75 to 2.25	28.91 to 29.41
No. 2X Virginia, sil. 2.25 to 2.75	32.94
No. 2 Virginia, sil. 1.75 to 2.25	32.44

Ferroalloys.—The ferromanganese market is practically stagnant, with sales in this territory of only two carloads reported. Demand for spiegeleisen is also very small, sales of a few carloads being noted at unchanged prices, some resale lots going at $45, furnace. There is practically no new demand for 50 per cent ferrosilicon and quotations are unchanged. Specifications on contract for these three alloys, however, continue heavy because steel output maintains a large volume. There are no developments noted in the manganese ore or ferrochromium markets.

Cast-Iron Pipe.—Demand for water pipe continues heavy and prices firm. Municipal tenders are decreasing in number but private buying is still a fairly large item. Producers are well booked into the fall. A current municipal tender is from the Department of Water Supply, Gas and Electricity, New York, and calls for bids from contractors on work involving about 700 tons of mostly 20-in. water pipe. Bids open Aug. 17. We quote per net ton, f.o.b. New York, in carload lots, as follows: 6-in. and larger, $62.30; 4-in. and 5-in., $67.30; 3-in., $77.30, with $5 additional for Class A and gas pipe. While quotations continue weak in the soil pipe market, business shows a slight improvement, evidently stirred into activity by the large discounts now being offered. Makers are maintaining their recent policy of booking only a few carloads for prompt shipment at present prices, which they claim are too low for profit. We quote discounts of both Northern and Southern makers, f.o.b. New York, in carload lots, for prompt shipment, as follows: 6-in. standard, 39½ to 40¾ per cent off list; heavy, 49½ to 50¾ per cent off list.

Warehouse Business.—A number of warehouses in this district report better business during the first half of August than in the same part of July. Quotations on practically all products are unchanged, although reports of shading on bars and plates persist, despite lack of confirmation. The market on black and galvanized sheets is slightly firmer than for several weeks. While a range of 4.65c. to 5.00c. per lb. base on black and 5.65c. per lb. base on galvanized is still justified, the minimum on both black and galvanized is said to be more often 4.75c. and 5.75c. per lb. Satisfactory orders, however, will still bring out the lower quotation. The warehouse market on wrought iron and steel pipe is quiet, but shading is no longer prevalent, despite the fact that some dealers are reported as not overly anxious to carry heavy stocks. Brass and copper products have declined ¾c. to 1c. per lb. for material out of stock. We quote prices on page 460.

Finished Iron and Steel.—Outside of structural lines there is no activity of importance in the local steel trade. A fair volume of structural steel work is being placed and more inquiry is coming out, not in large amounts, but sufficient to give promise of enough work to last throughout the year. In addition to projects now actually in the market there is a prospect that subway construction work in New York will soon call for large tonnages, most of which, however, would not be delivered until next year or later. The price situation is unchanged, prices being firm on all products. There is not enough business to afford a real test of prices, but the views of the mills are firm, particularly in view of the change to the 8-hr. day beginning this week.

We quote for mill shipments, New York delivery, as follows: Soft steel bars, 2.74c.; plates and structural shapes, 2.84c.; bar iron, 2.74c.

Coke.—An inquiry has come up for 2000 tons of blast furnace coke and a quotation of $4.75 per ton was made recently on 3000 tons of medium sulphur furnace coke. Standard foundry grades appear to be firmer. While $5.50 per ton can be done on prompt carloads on standard foundry coke, the range of current quotations extends as high as $1 above this figure. On by-product coke prices are $11.34, Newark, and $11.41, Jersey City.

Old Material.—Although the market is substantially unchanged, a better tone is reported and prices are as a rule firmer. No. 1 heavy melting steel delivered into eastern Pennsylvania is still $15.50 per ton, with railroad quality or equivalent bringing $16. The buying price New York of this grade ranges from $12.75 to $13.25 per ton, with No. 1 yard steel at $11.50 to $12 per ton. Stove plate is active, with shipments going forward to Harrisburg, Phoenixville, Pa., and to New Jersey foundries at $16.75 and $17 per ton, delivered, depending upon the freight rate. Specification pipe shows no change, $10.25 to $10.75 per ton about covering the present market based upon shipments to Lebanon, Pa., at $14.50 per ton, delivered.

Buying prices per gross ton, New York, follow:

Heavy melting steel, yard	$11.50 to $12.00
Steel rails, short lengths, or equivalent	12.75 to 13.25
Rails for rolling	16.00 to 18.00
Relaying rails, nominal	25.00 to 26.00
Steel car axles	19.00 to 20.00
Iron car axles	25.00 to 26.00
No. 1 railroad wrought	14.00 to 14.50
Wrought iron track	13.50 to 14.00
Forge fire	9.50 to 10.00
No. 1 yard wrought, long	13.00 to 13.50
Cast borings (clean)	9.50 to 10.00
Machine-shop turnings	9.50 to 10.00
Mixed borings and turnings	9.00 to 10.00
Iron and steel pipe (1 in. diam., not under 2 ft. long)	10.25 to 10.75
Stove plate	12.75 to 13.25
Locomotive grate bars	12.50 to 13.50
Malleable cast (railroad)	18.00 to 19.00
Cast-iron car wheels	17.00 to 18.00

Prices which dealers in New York and Brooklyn are quoting to local foundries per gross ton follow:

No. 1 machinery cast	$19.00 to $20.00
No. 1 heavy cast (columns, building materials, etc.), cupola size	18.00 to 19.00
No. 1 heavy cast, not cupola size	16.00 to 17.00
No. 2 cast (radiators, cast boilers, etc.)	16.00 to 17.00

Detroit Scrap Market Dull

DETROIT, Aug. 14.—There is no activity in the scrap market and prices are substantially unchanged.

The following prices are quoted on a gross ton basis, f.o.b. cars producers' yards, excepting stove plate, automobile and No. 1 machinery cast, which are quoted on a net ton basis:

Heavy melting steel	$14.40 to $15.00
Shoveling steel	14.50 to 16.50
No. 1 machinery cast	17.00 to 19.00
Cast borings	9.75 to 10.75
Automobile cast scrap	21.00 to 23.00
Stove plate	14.00 to 16.00
Hydraulic compressed	11.50 to 12.50
Turnings	7.25 to 8.25
Flashings	9.50 to 10.50

Cincinnati

Buying Only for Definite Requirements—Dip in Southern Iron

CINCINNATI, Aug. 14.—Both sales and inquiries fell off during the past week as compared with the previous one, but the undertone of the market is considerably improved. Buyers continue to place orders for their immediate requirements, and it is only occasionally that any interest is shown in fourth quarter. Prices in the North are a little stronger as far as furnaces are concerned, but middle interests continue to quote 50c. a ton below the regular furnace prices. Most of the larger sales are being made at the lower prices. For instance, an Indiana melter bought two lots of 500 tons each at $25.50, Ironton basis, in competition with a Lake furnace. Another Indiana consumer bought several hundred tons at a price said to be $25.75, Ironton. Other sales ranging up to 200 tons were made direct by furnaces at $26. Resale Northern iron is now pretty well out of the way and it is expected that $26, Ironton, will be established as the southern Ohio market. A Terre Haute melter is reported to have bought 1000 tons of malleable iron at $26.50, Chicago. On Southern iron, $23.50 can be done on Tennessee irons, and some sales of small lots have been made. From the Birmingham district the lowest price heard of today is $27, furnace, the low-priced Alabama seller having withdrawn from the market. This price, however, can only be done on nearby delivery. There is no activity in Bessemer or basic irons, and only occasional sales of carload lots of silveries are reported. There is no change in the furnace situation in southern Ohio, Marting, Wellston and Hanging Rock furnaces still being in blast on foundry grades, Globe and Jisco silveries, and Portsmouth and two Ashland furnaces on basic.

Based on freight rates of $4.05 from Birmingham and $2.27 from Ironton, we quote f.o.b. Cincinnati:

Southern coke, sil. 1.75 to 2.25 (base)	$27.55
Southern coke, sil. 2.25 to 2.75 (No. 2 soft)	28.05
Ohio silvery, 8 per cent	36.77
Southern Ohio coke, sil. 1.75 to 2.25 (No. 2)	28.27
Basic Northern	27.27
Malleable	28.27

Tool Steel.—Improvement is noted in the demand for tool steel for the first time since the middle of June. Prices are unchanged, 18 per cent tungsten high speed steel being quoted at 75c. to 95c. per lb.

Finished Material.—Orders were light during the past week, more particularly in bars and structural shapes, and mills are now able to make some pretty quick deliveries on this class of material. Heavy plates are also moving slowly, but on light plates orders are more numerous. The demand for sheets has not sustained the improvement noted last week, but some "feelers" are being sent out by some of the larger manufacturers for fourth quarter requirements. There is little activity in wire products or track accessories. Bolts and nuts have been in good demand. Prices generally are being firmly maintained, and with the exception of reinforcing bars and hot strips no changes have been reported.

Cincinnati jobbers quote: Iron and steel bars, 3.50c.; reinforcing bars, 3.60c.; hoops, 4.55c.; bands, 4.25c.; shapes, 3.60c.; plates, 3.60c.; cold-rolled rounds, 4.50c.; cold-rolled flats, squares and hexagons, 5c.; No. 10 blue annealed sheets, 4.25c.; No. 28 black sheets, 5.35c.; No. 28 galvanized sheets, 6.35c.; No. 9 annealed wire, $3.60 per 100 lb.; common wire nails, $3.60 per keg base.

Warehouse Business.—Jobbers report a greater number of small orders than for some weeks, with prices being firmly maintained.

Coke.—There is little activity in coke, and distress shipments are being offered at slightly lower prices. Connellsville furnace is quoted at $4.75 to $5, ovens, and foundry coke at $5.50 to $7.50. New River foundry coke is quoted at $11 to $12; Wise County foundry, $6.50, and furnace, $5.75. By-product producers are quoting $9, Connellsville basis.

Old Material.—The scrap market in Cincinnati district is very quiet, but some sales have been made to Southern points. Prices are about the same as last week.

We quote dealers' buying prices, f.o.b. cars Cincinnati:

Per Gross Ton		
Bundled sheets	$12.50 to	$13.00
Iron rails	15.00 to	15.50
Relaying rails, 50 lb. and up	28.00 to	28.50
Rails for rolling	16.00 to	16.50
Heavy melting steel	14.50 to	15.00
Steel rails for melting	14.50 to	15.00
Car wheels	14.50 to	15.00
Per Net Ton		
No. 1 railroad wrought	12.50 to	13.00
Cast borings	9.00 to	9.50
Steel turnings	8.50 to	9.00
Railroad cast	16.00 to	16.50
No. 1 machinery cast	18.50 to	19.00
Burnt scrap	11.50 to	12.00
Iron axles	21.50 to	22.00
Locomotive tires (smooth inside)	13.50 to	14.00
Pipes and flues	8.50 to	9.00

Birmingham

Pig Iron Stagnant—Orders Suspended—Early Change Expected

BIRMINGHAM, ALA., Aug. 14.—The drop to $24 failed to bring much business to the maker offering limited tonnage at that base price. Other makers, selling at $27, booked a few car lots. The Birmingham iron market was never more stagnant. The break is looked for toward the end of the month, when blast furnaces must earnestly consider new business, closing down stacks or piling iron on an uncertain price base. Melters have shown absolutely no interest except on taking as little iron, already contracted for, as possible. Hold-up orders are causing the same stock accumulations as last month. Up to the close of the week the merchant furnaces were still going as in July, the only closing down being a Tennessee company stack which was on ferromanganese. Foundry melt is not keeping the pace and lack of new business in stoves and other lines suggests early curtailment of present full operations in that quarter unless a change for the better occurs. The soil pipe makers are all out of the market and that cuts a considerable figure with Southern furnaces. Some Southern iron is understood to have sold in the Middle West under $24, and it is admitted that Birmingham can do no business there until there is a readjustment of base or a rise in price in other fields.

We quote per gross ton f.o.b. Birmingham district furnaces as follows:

Foundry, silicon 1.75 to 2.25	$24.00
Basic	24.00
Charcoal, warm blast	$33.00 to 34.00

Finishing Mills.—There has been no change at any of the finishing steel mills. All are on full turn, but new business comes in slowly. Wire mills are down to a four to five weeks' backlog. Cuba took 3500 tons of steel rails last week via Mobile, Havana, Cabana, Matanzas and other points dividing the cargo. The Tennessee company will put in effect the 8-hr. day when instructed by New York, and other concerns like the Gulf States Steel Co. say they will follow the example as additional men are procurable. Steel bars are quoted 2.65c., f.o.b. Birmingham.

Cast Iron Pipe.—It was a dull week in pressure pipe; many municipalities reported holding off for lower prices in view of weakness of the iron market. The base remains at $49, with all shops booked far ahead. Soil pipe is very dull at $50 to $55.

Coal and Coke.—Standard foundry coke is obtainable at $8, spot. Coal is slightly more active than usual for this time of the year.

Old Material.—The scrap market reports a dearth of new business and some requests to hold up deliveries. Extreme caution marks all industrial operations.

We quote per gross ton f.o.b. Birmingham district yards, nominal prices, as follows:

Old steel rails	$16.00 to	$18.00
No. 1 steel	14.00 to	16.00
No. 1 cast	20.00 to	21.00
Tram car wheels	20.00 to	21.00
Car wheels	19.00 to	20.00
Stove plate	15.00 to	16.00
Machine shop turnings	10.00 to	12.00
Cast iron borings	10.00 to	12.00

Boston

Pig Iron Sales Contract—Some Foundries Not to Buy Until September

BOSTON, Aug. 14.—Pig iron sales have contracted sharply. The H. B. Smith Co., Westfield, Mass., reported to have bought 2000 to 3000 tons, silicon 1.75 to 2.25 per cent, fourth quarter iron at $27.65, delivered, now has sufficient iron to carry it through 1923, and will not purchase other contemplated tonnages. Other business put through was comparatively small, the grand total probably being around 6000 tons. The Westfield sale is not a fair market basis, inasmuch as the furnace giving the option at $24, furnace, is now quoting $25. Sales of Buffalo No. 2X and No. 1X were made at $25 and $25.50, respectively. All eastern Pennsylvania furnaces are on a $25, $25.50 or $26 furnace base and maintaining differentials, while Alabama and Virginia furnaces doing business in New England are holding prices. The market, therefore, appears steadier. Buying in New England during the recent price cutting was remarkably small. Several foundries say they will buy iron in September. The Sullivan Machinery Co., Claremont, N. H., wants 100 tons each of Northern iron, silicon 2.25 to 2.75 per cent, low phosphorus iron silicon 1.75 and 2.25 per cent, and Virginia or Northern iron, silicon 3.25 to 3.75 per cent, prompt shipment, the largest open inquiry in the market today.

We quote delivered prices on the basis of the latest reported sales as follows, having added $3.65 freight from eastern Pennsylvania, $4.91 from Buffalo, $5.92 from Virginia, and $9.60 from Alabama.

East. Penn., sil. 2.25 to 2.75	$29.15 to $30.15
East. Penn., sil. 1.75 to 2.25	28.65 to 29.65
Buffalo, sil. 2.25 to 2.75	29.91 to 30.41
Buffalo, sil. 1.75 to 2.25	29.91 to 30.41
Virginia, sil. 2.25 to 2.75	32.42 to 32.92
Virginia, sil. 1.75 to 2.25	31.92 to 32.42
Alabama, sil. 2.25 to 2.75	35.10 to 37.10
Alabama, sil. 1.75 to 2.25	34.60 to 36.60

Warehouse Business.—Although not as active as heretofore, the movement of iron and steel out of warehouses is running ahead of that for August, 1922. Certain sizes of steel bars are in limited supply, but generally speaking stocks are in fair condition. Stocks of wire nails, on the other hand, are broken, mills remaining several weeks behind on shipments. Tremont pattern 8-penny cut floor nails and 20-penny common now take an additional $1 to the regular base price. Producers find there are 30 per cent more of these nails to the pound than in a pound of Western pattern.

Soft steel bars, $3.61½ a 100 lb. base; flats, $4.40; regular concrete bars, $3.76½; deformed bars, stock lengths, $3.76½ to $3.89; structural steel, $3.71½; tire steel, $4.80 to $5.15; open-hearth spring steel, $8 to $10; crucible spring steel, $12; regular steel bands, $4.80; bands over 6 in. wide, $5.05 to $5.30; hoop steel, $5.80 to $6.30; cold rolled steel, $4.75 to $5.25; refined iron, $3.61½; best refined, $4.75; Wayne iron, $5.50; Norway iron, $6.60 to $7.10.

Coke.—Melters continue to specify quite freely against contracts placed some time ago with New England makers of by-product foundry coke, the market for which is $13.50 a ton, delivered within New England. Ovens are making good shipments, notwithstanding heavy demands on them for domestic fuel. Some easing off in specifications is anticipated the last half of this month. Foundries are experiencing a falling off in new business. Jobbing foundries generally are operating on business picked up from week to week. Some, however, are booked into October. The General Electric Co., Lynn, Mass., is reported to have stopped placing business with forward delivery dates, and given order to clean up outstanding contracts. Manufacturers are beginning to think of year-end inventories. Gas companies are showing interest in run-of-oven Connellsville coke, one sale of 2500 tons at a price not made public having been made the past week. Foundries, however, show little interest in Connellsville fuel.

Old Material.—Holders of raw material are still indisposed to sell at going prices. One of the largest brokers in this territory, offering $15.50, delivered Pennsylvania, for heavy melting steel, has raised his price 50c. without attracting more than a car lot here and there. Offers of $12.50 on cars for delivery in New England likewise fail to stimulate business. A few car lots of mixed borings and turnings have been picked up at last week's prices, but the market for most other kinds of material, suitable for mills, is fully as lifeless as a week ago. One broker, unable to buy No. 1 machinery cast at prevailing rates, is sounding out the New York market. General sentiment in the trade is that business will not improve much before September, if then.

The following prices are for gross ton lots delivered consuming points:

No. 1 machinery cast	$22.00 to $23.00
No. 2 machinery cast	20.00 to 21.00
Stove plate	15.50 to 16.50
Railroad malleable	24.00 to 24.50
Street car axles	21.00 to 21.50

The following prices are offered per gross ton lots f.o.b. Boston common rate shipping points:

No. 1 heavy melting steel	$11.50 to $12.00
No. 1 rail wrought	12.50 to 13.00
No. 1 yard wrought	11.50 to 12.00
Wrought pipe (1-in. in diam., over 2 ft. long)	8.50 to 9.00
Machine shop turnings	8.00 to 8.50
Cast iron borings, rolling mill	10.50 to 11.00
Cast iron borings, chemical	11.50 to 12.00
Blast furnace borings and turnings	8.00 to 8.50
Forged scrap and bundled skeleton	9.00 to 9.50
Shafting	18.00 to 18.50
Street car axles	18.00 to 18.50
Rails for rerolling	13.00 to 13.50

St. Louis

Wabash Inquiring for 10,000 Tons of Rails—Pig Iron Inquiry Increasing

ST. LOUIS, Aug. 14.—An increasing number of inquiries for pig iron were received from melters in this district during the last week. Melters seem to feel that the market has about reached bottom, although some are still hesitant to buy more than for immediate needs. The principal transaction of the week was the sale of 2000 tons to a local melter, the order being divided among several makers. The original inquiry referred to in this column last week was for 5000 tons. The St. Louis Coke & Iron Co., which got a part of the tonnage just mentioned, also sold 200 tons of foundry iron to an Illinois melter and 150 tons to a local concern. An Indiana melter wants 1400 tons for fourth quarter delivery. An Illinois melter's inquiry is for 1000 tons, half Northern and half Southern, and a Missouri melter wants 175 tons of either. The market for Northern iron is at $26.50 to $27, Chicago, Southern makes $24, although some quotations are as high as $27.

We quote delivered consumers' yards, St. Louis, as follows, having added to furnace prices $2.15 freight from Chicago, $3.28 from Birmingham (rail and water), $5.17 from Birmingham, all rail, and 81 cents average switching charge from Granite City:

Northern fdy., sil. 1.75 to 2.25	$29.16
Northern malleable, sil. 1.75 to 2.25	29.16
Basic	29.16
Southern fdy., sil. 1.75 to 2.25	29.17

Finished Iron and Steel.—The first rail inquiry in some time from a St. Louis railroad was issued this week by the Wabash for 10,000 tons of 90-lb. section. The order for 1000 tons of reinforcing bars for the Cohakia plant of the Union Electric Co. went to the Scullin Steel Co. A marked increase of inquiries from manufacturers of steel products is reported, but not many have developed into orders. Jobbers are specifying against contracts to balance stocks, but are not placing new business to speak of. Railroads are inquiring for track equipment, such as frogs and switches, in small quantities. A Texas inquiry is for 500 tons of bars.

For stock out of warehouse we quote: Soft steel bars, 3.35c. per lb.; iron bars, 3.35c.; structural shapes, 3.45c.; tank plates, 3.45c.; No. 10 blue annealed sheets, 4.45c.; No. 28 black sheets, cold rolled, one pass, 5.20c.; cold drawn rounds, shafting and screw stock, 4.45c.; structural rivets, 4.15c.; boiler rivets, 4.25c.; tank rivets, ⅞ in. and smaller, 50-5 per cent off list; machine bolts, 45-5 per cent; carriage bolts, 40-5 per cent; lag screws, 50-5 per cent; hot pressed nuts, square or hexagon blank, $2.50; and tapped, $2.50 off list.

Coke.—The market for coke continues weak, production continuing greater than the demand. Connellsville coke has been sold as low as $5.50, ovens, although some of the best grades have brought as high as $7. By-product makers have been accumulating stocks.

Old Material.—The only buying by consumers is of a few specialties and but little of them. Dealers continue to absorb all railroad lists offered and are laying down material in yards in anticipation of an expected demand in September. One dealer bought 4000 tons, the scrap of 700 dismantled cars offered by the Cotton Belt. The Great Northern and Northern Pacific have lists amounting to 2000 tons each. Other lists, which will probably be taken care of by local dealers, include Mobile & Ohio, 3500 tons; Missouri Pacific, 1300 tons; Kansas City Southern, 320 tons, and Kansas City Terminal, 350 tons.

We quote dealers' prices f.o.b. consumers' works, St. Louis industrial district and dealers' yards, as follows:

Per Gross Ton

Iron rails	$16.00 to $16.50
Rails for rolling	17.50 to 18.00
Steel rails less than 3 ft.	18.50 to 19.00
Relaying rails, 60 lb. and under	26.00 to 27.00
Relaying rails, 70 lb. and over	33.50 to 34.50
Cast iron car wheels	18.50 to 19.00
Heavy melting steel	16.50 to 17.00
Heavy shoveling steel	16.50 to 17.00
Frogs, switches and guards cut apart	16.50 to 17.00

Per Net Ton

Heavy axles and tire turnings	12.00 to 12.50
Steel angle bars	15.25 to 15.75
Iron car axles	25.00 to 26.00
Steel car axles	21.00 to 21.50
Wrought iron bars and transoms	20.00 to 21.00
No. 1 railroad wrought	15.00 to 15.50
No. 2 railroad wrought	16.50 to 17.00
Railroad springs	19.00 to 19.50
Cast iron borings	12.00 to 12.50
No. 1 busheling	16.00 to 16.50
No. 1 railroad cast	18.00 to 18.50
No. 1 machinery cast	18.50 to 19.00
Railroad malleable	17.00 to 17.50
Machine shop turnings	11.50 to 12.00
Champion bundled sheets	8.00 to 8.50

San Francisco

Moderate Buying of Pig Iron, but Scrap Business Quiet

SAN FRANCISCO, Aug. 8.—There has been no noteworthy variation in trade conditions in iron and steel during the last two weeks, except that which may be due in part to seasonal causes and to influences that have been felt in other parts of the country. While the published reports of this city's building permits show an increase as compared with last year, importers and handlers of steel used in construction say their business has slackened off during the last two months. The fact is that during the last few months there has probably been more construction of frame buildings, numerically speaking, but at the same time less demand for structural steel.

Pig Iron.—Business is of moderate volume, and while prices are not quotably lower than two weeks ago, importers report a noticeable undertone of easiness that may lead to a shading of present figures, in view of the downward tendency in Eastern districts. The imports by sea during July totaled about 2400 tons, the bulk of which was Scotch iron. A goodly portion was on account of orders booked last January and February for future delivery. During the last week there was a showing of firmness in Scotch iron, and it was advanced about 50 cents per ton, in view of the advance in price at ports of export. Present quotations range from $35 to $37 per ton, according to quality. Consumers are well supplied, and the activity is confined to small buying.

Coke.—For some weeks the market has been at a standstill. Practically all the coke ordered early in the year has arrived, and during July there were no imports by sea, although at least two cargoes have not yet come to hand. It is known that supplies are moderate, but how soon consumers will be obliged to replenish their stocks is a matter of conjecture. Much depends on how business shapes up in the near future.

Old Material.—Dealers report business very quiet, with available supplies plentiful for the next few months, if there should be no increase in requirements. Present quotable prices range from $13 to $15 per ton for the more desirable grades. Some dealers say they are getting as high as $16 per ton for the best grade of railroad iron. Receipts at points of accumulation continue liberal. Another cargo of about 2600 tons is en route from Chile, practically all spoken for now.

Buffalo

About 15,000 Tons of Foundry Iron Sold—Concessions on Plates Shipped to Canada

BUFFALO, Aug. 14.—While the general feeling among operators is that the tide has turned and that some buying may be expected, the volume of business has been small with four of five producers. The exception so noted is that one furnace has sold between 12,000 and 15,000 tons of foundry iron. The others have only sold small tonnages. Because many of these are going to large melters indicate these tonnages are "fill-ins." Most producers have abandoned any expectation of any life in the third quarter and are turning hopefully to possible fourth quarter developments. The base price of $25 is firm although all sellers continue to find unverified reports of concessions from this figure; certainly a desirable tonnage would bring concessions and a cut of $1 per ton on present schedules would be likely. All sellers are trying to maintain differentials but are not successful. No further reduction in furnace operations has occurred but the present price schedule is touching a point which Buffalo producers say is lower than cost.

We quote f.o.b. per gross ton Buffalo as follows:

No. 1 foundry, 2.75 to 3.25 sil.	$26.00
No. 2X foundry, 2.25 to 2.75 sil.	25.50
No. 2 plain, 1.75 to 2.25 sil.	25.00
Basic	26.00
Malleable	26.00
Lake Superior charcoal	32.28

Finished Iron and Steel.—Price concessions on plates shipped to Canada are reported and 2.40c. has been made in several instances. For domestic use the 2.50c. price is firm and the same applies to shapes. New business in sheets is quiet, but some desirable inquiry is engaging attention and is expected to be placed here. Pipe and wire demand show no abatement and the call for bars continues lively.

We quote warehouse prices, Buffalo, as follows: Structural shapes, 3.65c.; plates, 3.65c.; soft steel bars, 3.55c.; hoops, 4.65c.; bands, 4.35c.; blue annealed sheets, No. 10 gage, 4.45c.; galvanized steel sheets, No. 28 gage, 6.35c.; black sheets, No. 28 gage, 5.25c.; cold rolled round shafting, 4.70c.

Coke.—Demand has been livelier. For prompt shipment prices range from $5.50 to $7.

Old Material.—Dealers have been buying small lots of heavy melting steel and piling them in the belief that stronger prices are near. The general market is stagnant and consumers are disinterested. One mill has shut down on incoming old material pending further notice.

We quote f.o.b. gross ton Buffalo as follows:

Heavy melting steel	$17.00 to $18.00
Low phos., 0.04 and under	23.50 to 24.50
No. 1 railroad wrought	15.00 to 16.00
Car wheels	16.50 to 17.00
Machine shop turnings	8.50 to 9.50
Cast iron borings	15.00 to 16.00
No. 1 bushelings	15.50 to 16.00
Stove plate	17.00 to 17.50
Grate bars	17.00 to 17.50
Bundled sheet stampings	10.00 to 11.00
No. 1 machinery cast	19.50 to 20.50
Hyraulic compressed	15.00 to 16.00
Railroad malleable	20.00 to 21.00

Philadelphia

Pig Iron Inactive and Prices Steady—Scrap Market Stronger

PHILADELPHIA, Aug. 14.—Steel business is extremely quiet and, following the recent buying movement in pig iron, there has been a cessation in demand, particularly for large tonnages. There is lacking in steel trade circles some of the optimism which was beginning to assert itself a week or two ago, the changed attitude being due largely, it appears, to the critical situation in Europe. Some of the Eastern mills are within 30 days of the end of their orders, and new tonnage is not coming in rapidly enough to give much encouragement. Delivery promises are shortening, and, on plates, one or two mills can give almost immediate shipment. While there has been no let-down in mill operations, some of the allied interests have felt the effects of reduced business in their operating schedules. For example, one Eastern bolt and nut plant is running only four days a week.

Prices of finished steel show unusual strength in view of the fact that many of the mills are now hungry for tonnage. Confident that the change to the 8-hr. day will help to restore the balance between supply and demand, the steel companies of this district count upon a continuance of present selling prices for the next few months at least. There is not this confidence, however, in the pig iron trade, which is trying to hold prices at $25 a ton for foundry iron, but is not yet certain that the demand will be sufficient over the next few months to maintain this level.

Pig Iron.—The recent buying movement has left a straggling volume of business in its wake in which the inquiries and orders are mostly small, though there has been a sprinkling of 1000 and 2000-ton lots in the past week. However, there has been a sharp falling off in sales as compared with a few weeks ago. Most of the furnaces are now holding firmly to a base price of $25 a ton for foundry iron, but this level is not firmly established as a minimum, sales having been made within the past few days at $24.50 for No. 2 plain and $25 for No. 2X. Some furnaces are piling some of this iron they are making, but on the whole there is probably less of this than during July, as more iron is now being called for by the foundries. Indications are that melters are going along on a hand-to-mouth policy, this being borne out by the frequency of requests to hurry shipments of carload lots. Barring an anthracite coal strike Sept. 1, it is the belief of pig iron sellers that the market will remain at just about its present price level for next the few months. Some see a possibility of lower prices, but, as the market level today is close to cost, there will undoubtedly be a further tendency to restrict production rather than to make further price concessions. Buyers are taking a conservative attitude and few of them are covering beyond October. A Virginia cast-iron pipe foundry has bought about 7000 tons of Virginia iron on which prices, it is stated, were shaded to below $26.

The following quotations are, with the exception of those on low phosphorus iron, for delivery at Philadelphia and include freight rates varying from 76 cents to $1.64 per gross ton:

East. Pa. No. 2 plain, 1.75 to 2.25 sil.	$25.26 to $26.64
East. Pa. No. 2X, 2.25 to 2.75 sil	25.76 to 26.14
East. Pa. No. 1X	26.26 to 26.76
Virginia No. 2 plain, 1.75 to 2.25 sil.	31.17 to 31.67
Virginia No. 2X, 2.25 to 2.75 sil.	31.67 to 32.67
Basic delivered eastern Pa.	25.00
Gray forge	25.50 to 26.00
Malleable	26.26 to 26.84
Standard low phos. (f.o.b. furnace)	29.00 to 30.00
Copper bearing low phos. (f.o.b. furnace)	32.00 to 33.00

Foreign Pig Iron

All prices f.o.b. cars Philadelphia, duty paid.

Continental foundry, 1.80 to 2.50 sil.	$25.50
Continental foundry, 2.50 to 3.25 sil.	26.50
Low phos., copper free, guar. not over 0.035 per cent phos.	31.50
Continental, phos. 1.50; sil. 2 to 3	25.50

Ferroalloys.—The demand for ferromanganese is light. Prices remain at $117.50, furnace or seaboard, on domestic or foreign alloy.

Semi-Finished Steel.—Very little business in billets is being done and prices remain unchanged at $42.50, Pittsburgh, for open-hearth rerolling quality and at $47.50 to $50, Pittsburgh, for forging quality, but eastern mills do not seem anxious for business in forging billets at $47.50.

Plates.—One or two eastern mills are now offering shipments of plates in a week or less. There is a marked lack of orders and even the most fortunate mills have little, if any, more than 30 days' work ahead. Plate mill representatives deny most emphatically reports of a weakening in prices, which seemingly have emanated from a railroad purchasing office which was said to have obtained a concession of $3 a ton. According to all indications, the plate price remains firm at 2.50c., Pittsburgh.

Structural Material.—The Jones & Laughlin Steel corporation has taken the contract to fabricate 1100 tons for the Bulletin building annex. The largest new inquiry in the market is 1500 tons for a warehouse for the Pennsylvania Sugar Co., Philadelphia. Except for one Eastern mill which, needing tonnage, has made sales at 2.40c., Pittsburgh, the market appears to be firm at 2.50c.

Ore.—Receipts of ore at this port during the week ended were as follows: Iron ore from French Africa, 7800 tons; Sweden, 7400 tons; chrome ore from India, 2000 tons; manganese ore from British West Africa, 3467 tons.

Old Material.—Whether or not a turn has actually come, it seems to be the strong opinion of leading brokers and dealers that prices will go no lower, and there is at least one important advance, 50c. a ton, on heavy melting steel. A large Eastern buyer, being unable to obtain sufficient tonnage at $15.50, which was its price last week, came out on Monday with offers of $16, delivered, and there has been a sale to another eastern mills at $16.50. One leading broker says he would not consider selling a tonnage of steel scrap at less than $17. An indication that many brokers are of like mind on the possibility of a turn in the market is the scrambling that has been going on within the past few days to cover on old orders. Nearly every broker with orders in hand is now actively in the market to cover and this in itself has created a slightly firmer tone in prices.

We quote for delivery at consuming points in this district as follows:

No. 1 heavy melting steel	$16.00 to $16.50
Scrap rails	16.00 to 16.50
Steel rails for rolling	17.00 to 18.00
No. 1 low phos., heavy 0.04 and under	21.50 to 22.50
Cast iron car wheels	20.00 to 21.00
No. 1 railroad wrought	18.00 to 19.00
No. 1 yard wrought	17.00 to 18.00
No. 1 forge fire	14.00 to 14.50
Bundled sheets (for steel works)	13.50 to 14.00
No. 1 busheling	15.50 to 16.00
Mixed borings and turnings (for blast furnace use)	12.50 to 13.50
Machine shop turnings (for steel works use)	13.50 to 14.00
Machine shop turnings (for rolling mill use)	14.50 to 15.00
Heavy axle turnings (or equivalent)	14.50 to 15.00
Cast borings (for steel works and rolling mills)	15.00 to 15.50
Cast borings (for chemical plants)	18.00 to 19.00
No. 1 cast	20.00 to 21.00
Heavy breakable cast (for steel plants)	18.50 to 19.00
Railroad grate bars	17.00 to 18.00
Stove plate (for steel plant use)	17.00 to 17.50
Railroad malleable	19.00 to 20.00
Wrought iron and soft steel pipes and tubes (new specifications)	15.00 to 15.50
Shafting	22.00 to 24.00
Steel axles	24.00 to 26.00

Bars.—From jobbers and manufacturing consumers are being received a fair number of orders for steel bars, mostly small lots for early shipment. Bar iron is not in large demand, but the price is being firmly held at 2.40c., Pittsburgh, by most of the makers. One company continues to make some sales at 2.35c., Pittsburgh. The price of steel bars remains strong at 2.40c., Pittsburgh.

Warehouse Business.—Local warehouses continue to

enjoy a fairly substantial volume of business. Prices are firm and unchanged. For local delivery we quote as follows:

Soft steel bars and small shapes, 3.55c.; iron bars (except bands), 3.55c.; round edge iron, 3.75c.; round edge steel, iron finished, 1½ x ½ in., 3.75c.; round edge steel planished, 4.55c.; tank steel plates, ¼ in. and heavier, 3.65c.; tank steel pates, ⅜ in., 3.95c.; blue annealed steel sheets, No. 10 gage, 4.25c.; black sheets, No. 28 gage, 5.15c.; galvanized sheets, No. 28 gage, 6.25c.; square twisted and deformed steel bars, 3.65c.; structural shapes, 3.65c.; diamond pattern plates, ¼-in., 5.40c.; ⅜-in., 5.60c.; spring steel, 5c.; round cold-rolled steel, 4.35c.; square and hexagons, cold-rolled steel, 4.85c.; steel hoops, 1 in. and wider, No. 20 gage and heavier, 4.75c.; narrower than 1 in., all gages, 5.25c.; steel bands, No. 12 gage to ⅜-in., inclusive, 4.35c.; rails, 3.55c.; tool steel, 8.50c.; Norway iron, 7c.

Cleveland

Steel Corporation Deliveries Not Improving—Few Cancellations—Round Pig Iron Sales

CLEVELAND, Aug. 14.—Occasionally a sale of ore is being made to a belated buyer and a very few furnaces that are buying on a hand-to-mouth basis are finding no difficulty in meeting their requirements. The movement from upper lake ports continues very heavy and it will not be surprising if the August movement is as large as that for July. The receipts at Lake Erie ports in July amounted to 7,682,275 tons, compared with 6,646,679 tons a year ago. The receipts for the season amounted to 19,119,757 tons, compared with 11,949,884 tons the corresponding period last year. The balance on dock Aug. 1 was 4,956,705 tons, compared with 7,296,842 tons a year ago. Although the ore movement from upper lake docks and also from Lake Erie docks to furnaces has been very heavy, the railroads are giving remarkably fine service and the docks are having no difficulty in handling the immense tonnage.

The possible effects of the introduction of shorter hours at blast furnaces and steel plants is the subject of much discussion. Some operators are inclined to believe that considerable confusion will result until the men become adapted to the new regime and that in rolling mills there will be a reduction of output, but this opinion is not shared by other operators, who expect the change from 12 hr. to 8 and 10 hr. to be made gradually and without any disturbance of the furnace or mill operations. There is, of course, doubt as to whether the mills will be compelled to absorb the additional cost which will result from the shorter turn system. It is believed that unless there should be a decided slump in business, prices will not recede below those now considered as minimum, and there may be an advance toward fall equal to the increased cost due to the shorter hours.

Deliveries by Steel Corporation subsidiaries are not improving as a rule, and new orders are fully making up for the few cancellations which have been received. Some independents which cater to prompt business are giving quick delivery and other independents have improved their deliveries, but with one large independent deliveries are not better than 90 days for plates, 30 to 60 days for shapes and 60 days for bars. Some buyers report that they are not receiving as prompt deliveries as have been promised in some cases.

The present war in gasoline prices, considered in connection with possible Congressional investigations and action by the Department of Justice, is regarded as worthy of attention on account of the psychological effect which it may have on general business conditions.

Pig Iron.—The tonnage sold by Cleveland companies during the past week has been a fair volume, amounting to nearly 25,000 tons. One firm sold 15,000 tons of foundry and malleable iron, including one lot of 8000 tons, one of 3000 tons, and one of 2000 tons. A company having a furnace taking $1.76 freight rate sold 5000 tons of foundry iron for delivery in the Pittsburgh district at $24.50, furnace, and another company sold somewhat less than 2000 tons on the basis of $25, Valley, for No. 2 foundry. A Lake furnace, which had been quoting $26.50, furnace, on No. 2 foundry, is now selling at $25.50. Reports of extremely low prices on foundry iron cannot be verified and, on the whole, the price situation seems to be somewhat improved. Apparently no more basic is to be had at $24, Valley, and $24.50 is minimum, while $25 has been done.

Quotations below, except on basic and low phosphorus iron, are delivered Cleveland, and for local iron include a 50c. switching charge. Ohio silvery and Southern iron prices are based on a $3.02 freight rate from Jackson and $6 rate from Birmingham:

Basic, Valley furnace	$24.50
Northern No. 2 fdy., sil. 1.75 to 2.25	26.50
Southern fdy., sil. 1.75 to 2.25	30.50
Malleable	26.50
Ohio silvery, 8 per cent	37.52
Standard low phos., Valley furnace	32.00

Reinforcing Bars.—The storage warehouse to be built by the Nickel Plate Storage Co. at a cost of $160,000 is expected to call for a fair tonnage of reinforcing bars. Bids have not yet been called for. Many minor projects are being figured on. Rail reinforcing bars are still quoted at 2.30c. as the usual price.

Semi-Finished Steel.—The semi-finished steel market drags. Sometime ago it was fully expected that there would be activity by Aug. 1, but not a single transaction has been recorded recently and $42.50 is the nominal quotation.

Tool Steel.—Cleveland sellers of tool steel report that business has dropped off rapidly and that almost no orders are coming from Detroit. This change is attributed to temporary conditions, and it is expected that in another month there will be a decided increase in demand.

Bolts, Nuts and Rivets.—Although rivets continue to be quoted on a basis of $3 to $3.25 for structural and $3.10 to $3.35 for boiler rivets, the market is weak and concessions on desirable business to $2.90 and $3, respectively, are made. On bolts and nuts a fair amount of business is being done but concessions are sometimes granted. The outlook is that price revisions on cap and set screws may be announced soon.

Warehouse Business.—Jobbers in sheet and tin plate report that the business is not very brisk but that prices are being adhered to on tin plate and there is very little irregularity on sheets.

Jobbers quote steel bars, 3.36c.; plates and structural shapes, 3.46c.; No. 9 galvanized wire, 3.70c.; No. 9 annealed wire, 3.25c.; No. 28 black sheets, 4.65c.; No. 28 galvanized sheets, 5.80c.; No. 10 blue annealed sheets, 3.75c. to 4.06c.; cold rolled rounds, 3.90c.; flats, squares and hexagons, 4.40c.; hoops and bands, 1 in. and wider and 20 gage or heavier, 4.16c.; narrower than 1 in. or lighter than No. 20 gage, 4.60c.

Coke.—Some foundries that cater to the automobile trade are not so busy, and demand for coke from such plants has decreased, but on the whole there is little change in the situation. Prices on foundry grades still range all the way from $5.50 to $7 for prompt shipment. No contracting is being done.

Old Material.—The market is extremely dull with no buying of consequence going on and prices are unchanged.

We quote dealers' prices f.o.b. Cleveland per gross ton:

Heavy melting steel, nominal	$15.75 to $16.00
Rails for rolling	17.25 to 18.00
Rails under 3 ft	17.25 to 17.50
Low phosphorus melting	18.50 to 19.00
Cast borings	11.00 to 11.50
Machine shop turnings	9.75 to 10.00
Mixed borings and turnings	9.75 to 10.00
Compressed sheet steel	13.00 to 13.50
Railroad wrought	12.25 to 12.75
Railroad malleable	20.50 to 21.00
Light bundle sheet stampings	9.00 to 10.00
Steel axle turnings	14.00 to 14.50
No. 1 cast	18.50 to 19.50
No. 1 busheling	9.75 to 10.00
Drop forge flashings	9.75 to 10.00
Railroad grate bars	12.00 to 12.50
Stove plate	12.00 to 12.50
Pipes and flues	9.00 to 9.50

Finished Material.—Buying is not active but specifications are coming in satisfactorily and there is little change in prices. In some cases plate mills which have been getting 2.60c. are now accepting 2.50c. In structural material there is no cutting of the base price, but the fabricators are figuring very closely and

little new business has developed. Reports in regard to the automobile business vary somewhat, but representatives of steel companies in Detroit and Cleveland report to their principals that this business seems to be more stabilized than in past years and they say outlook for fall business, especially in replacing old cars, is very encouraging. Tubular business is extremely active and some companies are having difficulty in satisfying their customers with deliveries. Very little is now heard of shading of sheet prices. Sheet manufacturers declare that with sheet bars apparently pegged at $42.50 and with conversion cost about $32 there is no money in selling sheets at 3.75c. for No. 28 black. They say further that if, as seems certain, short hours in the steel plants will increase the cost of semi-finished material several dollars per ton it will be necessary for sheet manufacturers to get more than present prices in order to break even.

Steel Ingot Molds in Place of Cast Iron

Experience of a German Steel Mill Shows Successful Results—Composition and Life of the Steel Molds

AS is well known, the majority of ingot molds are made of cast iron, and a great many are made of direct metal. There has, however, always been more or less interest in steel ingot molds and extensive experiments have been carried out at several plants without successful results. The usual material abroad is also cast iron, but from time to time there are indications that steel is being tried.

The latest information on steel molds is in *Stahl und Eisen*, Dec. 28, 1922, by Fr. Schivetz, who is operating manager at Krompach. He describes his successful experiences in replacing cast iron molds, purchased on the outside with steel molds made in his own foundry. The molds used are the ordinary square ones for 3-ton ingots. Before the war the average life was 150 heats. In 1915 and 1916 the life of the molds steadily sank, and the latter part of 1916 only 70 to 80 heats could be cast. At the beginning of 1917 the average number sank to 60 to 70. The steel was top cast into molds standing on stools.

This poor life and large expense for molds led him to recall a previous experiment with a steel mold (AO) made in his company's own steel foundry which, after 122 heats, was ruined by the bad pouring of a careless workman. Accordingly in the autumn of 1916, six molds were made and put in operation, and in the winter of the same year the cast iron molds for the 3-ton ingots began to be entirely replaced by steel molds; at Krompach steel molds have been used ever since. From each foundry heat from four to seven molds are poured. A table is given showing the analyses and life of 74 steel molds made from 13 heats. The average life of all the steel molds used so far is 235, with a constantly increasing life. Part of this table is given below to show the analyses of the steel used and the average life per foundry heat:

Table of Composition and Life of German Steel Ingot Molds

Mold	Heat	Carbon Per Cent	Manganese Per Cent	Phosphorus Per Cent	Sulphur Per Cent	Silicon Per Cent	Life in Heats
A 0	3244	0.38	0.75	...	...	0.17	122
A 1	3443	0.41	0.89	0.04	...	0.13	125
A 2	224	0.34	0.69	0.04	...	0.10	203
A 3	1124	0.42	0.65	...	...	...	300
A 4, A 5.	1568	0.34	0.62	0.06	...	0.11	115.5
A 6	1884	0.37	0.74	0.08	...	0.14	305
A 7-13 ..	2132	0.42	0.38	0.07	0.05	0.09	180.8
A 21-27 ..	2514	0.47	0.53	0.07	0.05	0.18	206.1
A 36-41 ..	2853	0.34	0.50	0.07	...	0.17	229.5
A 44-49 ..	3265	0.35	0.37	...	0.06	0.18	214.8
A 50-53 ..	3357	0.38	0.66	0.09	0.04	0.17	252
A 59-64 ..	3523	0.32	0.41	...	0.06	0.10	226.6
A 81-86 ..	3726	0.33	0.40	0.08	0.05	0.12	223.8
A 105-109.	3914	0.39	0.44	...	0.04	...	251.8
A 117-122.	4085	0.33	0.54	...	0.05	0.24	255.4
A 122a-127	827	0.43	0.37	...	0.04	0.10	239
A 134-139.	942	0.34	0.50	...	0.04	0.15	239.8
A 146-151.	1098	0.35	0.49	...	0.04	0.05	269.8
A 176-181.	1453	0.38	0.44	...	0.04	0.05	264.3
AA	364	0.22	0.75	...	0.05	0.17	301

Great care must be taken when pouring into steel molds, as they are more easily burned than iron molds. Several molds had a short life on this account, indeed one of them, A151, was so badly and deeply melted by a green man that it was spoiled at the first cast. A great many were scrapped in a normal way, as in the case of iron molds because the cracks, tears, and wrinkles on their inner surfaces were so deep that it was either difficult to strip the ingots, or else the surface of the ingots was so furrowed and rough that they could not be rolled into particular sections.

The molds after use were placed on a rail-rack and only used again after 8 to 9 hrs. In only a few cases was distortion of the molds noticed, and it is believed this came from improper handling of the molds. Ribs on the molds have not been found necessary. Transverse cracks and bulging of the molds has not been noticed. It should be mentioned that in some cases a bad longitudinal crack was found after about 100 heats. It is believed this is because the molds are cast and used without annealing and that the interior strains cause these cracks when the inner surfaces become cracked, as they are apt to do after about 100 heats. In regard to dimensions, those that had been found satisfactory for cast iron were used without change and found acceptable, at least up to the present.

As shown in the table, the carbon varies from 0.35 to 0.45 per cent. A certain tensile strength is desirable, which could not be obtained with very soft steel. However, lower carbon can probably be used, and the table shows a mold with 0.22 per cent carbon which gave a life of 301 heats.

The managanese is usually from 0.5 to 0.8 per cent; the phosphorus shows a maximum of 0.09 per cent in the hardest steels; the sulphur 0.07 per cent as a maximum, which with the softer steels drops to 0.03 to 0.05 per cent. All the steels showed about the same silicon, and some aluminum was used. Recently several molds have been used with 0.20 to 0.25 per cent carbon; although they have so far stood only 80 to 100 heats, they have shown up as well as the harder steels.

Ordinary methods of molding are used, except that the cores are made of burned magnesite, used without any silica or other wash. This gives a very uniform and clean inner surface to the molds, and the cores can be removed very easily. After freshening, the magnesite can be used again. It is believed the good results obtained with the steel molds come from careful handling, and the present widespread mistrust of such molds would seem to be unfounded following the results obtained.

G. B. W.

To meet the demand for haulage work in metal mines, where requirements demand the use of a small locomotive on account of cage dimensions and where haulage is done on more than one level, the General Electric Co. has developed a 1½-ton locomotive fitted with a pantograph collector. The locomotive weighs 3000 lb. and is built for 18 or 20-in. gage. The overall length is 48 in., height 42 in., width 34 in. It is equipped with one 110-volt series motor giving a speed of 5 miles per hour.

The total production of the mining industry of the Santiago de Cuba consular district in 1922 was 468,340 tons of iron ore (hematite and magnetite) and about 20,000 gross tons of manganese ore containing about 30 per cent manganese, from which 4,100 tons of concentrated product was obtained. This shows a slight increase over 1921, due to greater activity in the steel industry in the United States.

British Iron and Steel Market

Pig Iron Dull—Semi-Finished Steel Sharply Up—Belgium Active in Selling Rails—Tin Plate Firm

(By Cable)

LONDON, ENGLAND, Aug. 14.

Pig iron is quiet and easier. Sellers of No. 3 Scotch foundry iron are asking £5 2½s. ($23.37) f.o.b. Banking of furnaces has not yet affected business, domestic and export demand being almost stagnant.

Hematite is weak, with few important sales. Foreign ore is dull, sellers of Bilbao Rubio asking 22¾s. ($5.19) ex-ship Tees.

Steel is quiet and unchanged. Germany is inquiring for shipbuilding constructional material, but is not inclined to pay the figures asked. Several thousand tons of billets for the Continent were quoted at £8 10s. ($38.76) f.o.b., with no buyers.

Pig iron exports for July amounted to 36,938 tons; the total exports of iron and steel were 307,610 tons.

Continental position is complex. Belgian material is practically the only material being offered and the works are fully sold up to October. Prices are firm, with an upward tendency, but buyers are disinclined to place orders except in specialties. The Société Anonyme des Laminoirs, Hauts-Fourneaux, Forges, Fonderies et Usines de la Providence, Marchienne-au-Pont, has secured a 10,000-ton rail order from the Argentine. Japan has placed a 3,500,000 fr. rail order in Belgium, resulting from the visit of the Belgian industrial mission.

In Germany the works of Thyssen & Co., at Hamborn, are closed. The Gelsenkirchener Bergwerke are operating on short time.

Tin plate is firm. Wales has secured a substantial oil plate contract from the Far East, on the basis of the minimum price, for September-October delivery. The quantity involved is several hundred thousand boxes. There is improved general demand, with anticipations of more business.

Galvanized sheets are steady, with demand good but for small quantities. The works are sold out to the end of September.

There has been further Japanese buying of black sheets at £19 10s. (3.97c. per lb.) f.o.b. The works are sold out for the remainder of this year. America is reported to be competing and booking orders for early shipment.

We quote per gross ton, except where otherwise stated, f.o.b. makers' works, with American equivalent figured at $4.56 per £1, as follows:

Durham coke, delivered	£2	1½s.				$9.46	
Bilbao Rubio ore†	1	4				5.47	
Cleveland No. 1 foundry	5	10				25.08	
Cleveland No. 3 foundry	5	2½	to £5	3s.		23.37 to	$23.48
Cleveland No. 4 foundry	4	17½				22.23	
Cleveland No. 4 forge	4	15	to	4	16	21.66 to	21.89
Cleveland basic	5	5				23.94	
East Coast mixed	4	17½	to	4	18	22.23 to	22.34
Ferromanganese	18	0				82.08	
Ferromanganese*	18	10				84.36	
Rails, 60 lb. and up	8	10	to	9	10	38.76 to	43.32
Billets	8	5	to	8	10	37.62 to	38.76
Sheet and tin plate bars, Welsh	9	2½				41.61	
Tin plates, base box	1	3	to	1	3⅛	5.24 to	5.27
						C. per Lb.	
Ship plates	9	10	to	10	0	1.93 to	2.04
Boiler plates	12	10	to	13	0	2.54 to	2.65
Tees	10	0	to	10	10	2.04 to	2.14
Channels	9	5	to	9	15	1.88 to	1.98
Beams	9	0	to	9	10	1.83 to	1.93
Round bars, ¾ to 3 in.	10	15	to	11	5	2.19 to	2.29
Galvanized sheets, 24 g.	18	15	to	19	0	3.82 to	3.87
Black sheets, 24 gage	13	10				2.75	
Black sheets, Japanese specifications	15	5				3.10	
Steel hoops	12	0	&	12	10*	2.44 &	2.54*
Cold rolled steel strip, 20 g.	17	5				3.51	
Cotton ties, Indian specifications	15	0				3.05	

*Export price. †Ex-ship, Tees, nominal.

Continental Prices, All F. O. B. Channel Ports, Delivery as Specified

Foundry pig iron:							
Belgium	£5	5s.	to £5		7½s.	$23.94 to	$24.51
France	5	5	to	5	7½	23.94 to	24.51
Luxemburg	5	5	to	5	7½	23.94 to	24.51
Billets:							
Belgium	7	5				33.06	
France	7	5				33.06	
Merchant bars:							
Belgium	8	0	to	8	5	1.63 to	1.68
Luxemburg	8	0	to	8	5	1.63 to	1.68
France	7	10				1.53	
Joists (beams):							
Belgium	7	12½	to	7	15	1.55 to	1.58
Luxemburg	7	15				1.58	
France	7	10	to	7	12½	1.53 to	1.55
Angles:							
Belgium	8	0	to	8	5	1.63 to	1.68
¼-in. plates:							
Belgium	8	15	to	9	0	1.78 to	1.83
⅜-in. plates:							
Luxemburg	7	15				1.58	
Belgium	7	10				1.53	

Mining Engineers in Ontario and Quebec

The 128th meeting of the American Institute of Mining and Metallurgical Engineers will be held in Canada, the sessions and excursions covering the period of Aug. 20 to 31. Monday, Aug. 20, will be spent at Toronto. The evening will be given over to films of mining operations in northern Ontario. At 11 p. m. the party leaves on a special train for Sudbury, where visits will be made on Tuesday to the mines of the International Nickel Co. and other corporations. For Wednesday and Thursday the schedule provides inspection trips in the Cobalt district. At the session of Wednesday evening papers will be read on geology, mining and smelting. Friday will be spent in the Kirkland Lake gold district, and Saturday at Iroquois Falls, where the great pulp and paper mills of the Abitibi Power & Paper Co. will be inspected.

Saturday and Sunday will be spent in the Porcupine district and the party will arrive at Quebec Monday evening, Aug. 27. Tuesday will be given over to excursions, the special train leaving at midnight for the Thetford asbestos mines. Technical sessions will be resumed on Thursday at the Mount Royal Hotel, Montreal, the program including several papers on iron and steel, mining, milling, petroleum, geology and metallurgy. The formal banquet will be held on Thursday evening. There will be sight-seeing excursions on Friday, Aug. 31.

As part of the special train starting from Toronto Monday night, Aug. 20, there will be several cars bringing eastern members of the institute, leaving New York Aug. 19.

Mine Engineers to Meet

Announcement of the third annual convention of the West Virginia-Kentucky Association of Mine Mechanical and Electrical Engineers shows three technical sessions on Oct. 19 and 20. Topics include

"Mechanical and Electrical Equipment Records," by J. H. Edwards.
"All-Rubber Insulated vs. Ordinary Braid-Covered Cables," committee report.
"Purchased Power vs. Individual Plants," open discussion.
"Construction and Care of Transformers" (with slides), by L. G. Mason.
"Improving Efficiency of Mine Pumping," committee report.
"Service from Manufacturers in Supplying Repair Parts," by F. M. Reigher.
"Hoisting Equipment," by M. A. Maxwell.
"Fan Drives for Ventilation," by J. J. Fluck.

The convention will be held at the Frederick Hotel, Huntington, W. Va. Inspection of industrial plants, on Saturday afternoon, will conclude the program.

Prices Finished Iron and Steel f.o.b. Pittsburgh

Carload Lots

Plates

Sheared, tank quality, base, per lb.....2.50c.

Structural Material

Beams, channels, etc., base, per lb.....2.50c.
Sheet piling.....2.65c.

Iron and Steel Bars

Soft steel bars, base, per lb.....2.40c.
Soft steel bars for cold finishing.....$3 per ton over base
Reinforcing steel bars, base.....2.40c.
Refined iron bars, base, per lb.....3.25c.
Double refined iron bars, base, per lb.....4.85c. to 5.00c.
Stay bolt iron bars, base, per lb.....8.00c. to 8.50c.

Hot-Rolled Flats

Hoops, ordinary gages and widths, base, per lb.....3.15c.
Bands, base, per lb.....3.15c.
Strips, base, per lb.....3.00c. to 3.15c.
Cotton ties, per bundle of 45 lb.....$1.62

Cold-Finished Steels

Bars and shafting base, per lb.....3.25c.
Strips, base, per lb.....5.00c.

Wire Products

Nails, base, per keg.....$3.00
Galvanized nails, 1 in. and over.....$2.25 over base
Galvanized nails, less than 1 in.....2.50 over base
Bright plain wire, base, No. 9 gage, per 100 lb.....2.75
Annealed fence wire, base, per 100 lb.....2.90
Spring wire, base, per 100 lb.....3.70
Galvanized wire, No. 9, base, per 100 lb.....3.35
Galvanized barbed, base, per 100 lb.....3.80
Galvanized staples, base, per keg.....3.80
Painted barbed wire, base, per 100 lb.....3.45
Polished staples, base, per keg.....3.45
Cement coated nails, base, per count keg.....2.70
Woven fence, carloads (to jobbers).....67½ per cent off list
Woven fence, carloads (to retailers).....65 per cent off list

Bolts and Nuts

Machine bolts, small, rolled threads..60 and 10 per cent off list
Machine bolts, small, cut threads..50, 10 and 10 per cent off list
Machine bolts, larger and longer..50, 10 and 10 per cent off list
Carriage bolts, ⅝ x 6 in.:
Smaller and shorter, rolled threads
50, 10 and 10 per cent off list
Cut threads.....50 and 10 per cent off list
Larger and longer.....50 and 10 per cent off list
Lag bolts.....60 and 10 per cent off list
Plow bolts, Nos. 1, 2 and 3 heads....50 and 10 per cent off list
Other style heads.....20 per cent extra
Machine bolts, c.p.c. and t. nuts, ⅝ x 4 in.
45 and 10 per cent off list
Larger and longer sizes.....45 and 10 per cent off list
Hot pressed square or hex. nuts, blank.....3.75c. off list
Hot pressed nuts, tapped.....3.75c. off list
C.p.c. and t. square or hex. nuts, blank.....3.75c. off list
C.p.c. and t. square or hex. nuts, tapped.....3.75c. off list
Semi-finished hex. nuts:
⅞ in. and smaller, U. S. S.....80 per cent off list
⅞ in. and larger, U. S. S.....75 per cent off list
Small sizes, S. A. E.....80 and 5 per cent off list
S. A. E., ⅝ in. and larger.....75 and 5 per cent off list
Stove bolts in packages.....75, 10 and 5 per cent off list
Stove bolts in bulk.....75, 10, 5 and 2½ per cent off list
Tire bolts.....50, 10 and 10 per cent off list
Bolt ends with hot pressed nuts..50, 10 and 10 per cent off list
Turnbuckles, with ends, ½ in. and smaller
55 and 5 to 50 per cent off list
Turnbuckles, without ends, ½ in. and smaller
70 and 10 to 65 and 5 per cent off list
Washers.....5c. to 5.25c. off list

Cap and Set Screws

Milled square and hex. head cap screws,
65 and 10 per cent off list
Milled set screws.....65 and 10 per cent off list
Upset cap screws.....75 per cent off list
Upset set screws.....75 per cent off list
Milled studs.....50 per cent off list

Rivets

Large structural and ship rivets, base, per 100 lb. $3.00 to $3.10
Large boiler rivets, base 100 lb..... 3.10 to 3.20
Small rivets.....65 and 10 to 65 and 5 off list

Track Equipment

Spikes, ⅝ in. and larger, base, per 100 lb..... $3.15
Spikes, ½ in., ⅝ in. and ¾ in., per 100 lb..... 3.50
Spikes, ⅞ in..... 3.50
Spikes, boat and barge, base, per 100 lb..... 3.50
Track bolts, ¾ in. and larger, base, per 100 lb.. 4.00 to 4.25
Track bolts, ½ in. and ⅝ in., base, per 100 lb.. 5.00 to 5.50
Tie plates, per 100 lb..... 2.55 to 2.60
Angle bars, base, per 100 lb..... 2.75

Welded Pipe

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	45	19½	¼ to ⅜	+11	+39
¼ to ⅜	51	25½	½	22	2
½	56	42½	¾	28	11
¾	60	48½	1 to 1½	30	13
1 to 3	62	50½			

Lap Weld

2	55	43½	2	23	7
2½ to 6	59	47½	2½	26	11
7 and 8	56	43½	3 to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			

Butt Weld, extra strong, plain ends

⅛	41	24½	2 to 3	61	50½
¼ to ⅜	47	30½	¼ to ⅜	+19	+54
½	53	42½	½	21	7
¾	58	47½	¾	28	12
1 to 1½	60	49½	1 to 1½	30	14

Lap Weld, extra strong, plain ends

2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 to 8	52	39½	7 to 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

To the large jobbing trade the above discounts are increased by one point, with supplementary discount of 5 per cent on black and 1½ points, with a supplementary discount of 5 per cent, on galvanized.

Boiler Tubes

Lap Welded Steel		*Charcoal Iron*	
2 to 2¼ in.	27	1½ in.	+18
2½ to 2¾ in.	37	1¾ to 1⅞ in.	+ 8
3 in.	40	2 to 2¼ in.	— 2
3¼ to 3¾ in.	42½	2½ to 3 in.	— 7
4 to 13 in.	46	3¼ to 4½ in.	— 9

Less carload lots 4 points less.

Standard Commercial Seamless Boiler Tubes

Cold Drawn			
1 in.	55	3 and 3¼ in.	36
1¼ and 1½ in.	47	3½ and 3¾ in.	37
1¾ in.	31	4 in.	41
2 and 2¼ in.	22	4½ in. and 5 in.	33
2½ and 2¾ in.	32		
Hot Rolled			
3 and 3¼ in.	38	4 in.	43
3½ in. and 3¾ in.	39		

Less carloads, 4 points less. Add $8 per net ton for more than four gages heavier than standard. No extras for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gage to be sold at mechanical tube list and discount. Intermediate sizes and gages not listed take price of net larger outside diameter and heavier gage.

Seamless Mechanical Tubing

Carbon under 0.30, base.....83 per cent off list
Carbon 0.30 to 0.40, base.....81 per cent off list
Plus usual differentials and extras for cutting. Warehouse discounts range higher.

Seamless Locomotive and Superheater Tubes

Cents per Ft.		Cents per Ft.	
2-in. O.D. 12 gage	15	2¼-in. O.D. 10 gage	20
2-in. O.D. 11 gage	16	3-in. O.D. 7 gage	35
2-in. O.D. 10 gage	17	1½-in. O.D. 9 gage	15
2¼-in. O.D. 12 gage	17	5⅝-in. O.D. 9 gage	55
2¼-in. O.D. 11 gage	18	5½-in. O.D. 9 gage	57

Tin Plate

Standard cokes, per base box.....$5.50

Terne Plate

(Per package, 20 x 28 in.)

8-lb. coating, 100 lb. base.....$11.00
8-lb. coating I. C.... 11.30
12-lb. coating I. C.... 12.70
15-lb. coating I. C.... 13.95
20-lb. coating I. C....$14.90
25-lb. coating I. C.... 16.20
30-lb. coating I. C.... 17.35
35-lb. coating I. C.... 18.35
40-lb. coating I. C.... 19.35

Sheets

Blue Annealed

Nos. 9 and 10 (base), per lb.....3.00c.

Box Annealed, One Pass Cold Rolled

No. 28 (base), per lb.....3.75c. to 3.85c.

Automobile Sheets

Regular auto body sheets, base (22 gage), per lb....5.35c.

Galvanized

No. 28 (base), per lb.....5.00c.

Long Ternes

No. 28 gage (base), 8-lb. coating, per lb.....5.30c.

Tin-Mill Black Plate

No. 28 (base), per lb.....3.85c.

Manufacturers have pamphlets, which can be had upon application, giving price differentials for gage and extras for length, width, shearing, etc.

Freight Rates

All freight rates from Pittsburgh on finished iron and steel products, carload lots, per 100 lb.:

Philadelphia, domestic.	$0.32	Buffalo	$0.265	St. Louis	$0.43	Pacific Coast	$1.34
Philadelphia, export...	0.235	Cleveland	0.215	Kansas City	0.735	Pac. Coast, ship plates	1.20
Baltimore, domestic...	0.31	Cleveland, Youngstown		Kansas City (pipe)...	0.705	Birmingham	0.58
Baltimore, export.....	0.225	Comb.	0.19	St. Paul	0.60	Memphis	0.56
New York, domestic...	0.34	Detroit	0.29	Omaha	0.735	Jacksonville, all rail..	0.70
New York, export.....	0.255	Cincinnati	0.29	Omaha (pipe)	0.705	Jacksonville, rail and water	0.415
Boston, domestic.....	0.365	Indianapolis	0.31	Denver	1.27		
Boston, export.....	0.255	Chicago	0.34	Denver (pipe).....	1.215	New Orleans	0.67

The minimum carload to most of the foregoing points is 36,000 lb. To Denver the minimum loading is 40,000 lb., while to the Pacific Coast on all iron and steel products, except structural material, the minimum is 80,000 lb. On the latter item the rate applies to a minimum of 50,000 lb., and there is an extra charge of 9c. per 100 lb. on carloads of a minimum of 40,000 lb. On shipments of wrought iron and steel pipe to Kansas City, St. Paul, Omaha and Denver the minimum carload is 46,000 lb. On iron and steel items not noted above the rates vary somewhat and are given in detail in the regular railroad tariffs.

Rates from Atlantic Coast ports (i.e., New York, Philadelphia and Baltimore) to Pacific Coast ports of call on most steamship lines, via the Panama Canal, are as follows: Pig iron, 35c.; ship plates, 40c.; ingot and muck bars, structural steel, common wire products including cut or wire nails, spikes, and wire hoops, 40c.; sheets and tin plates, 40c.; sheets, No. 12 gage and lighter, 50c.; rods, 40c.; wire rope cable and strands, 45c.; wire fencing, netting and stretcher, 40c.; pipes not over 12 in. in diameter, 55c.; over 12 in. in diameter, 2½c. per in. or fraction thereof additional. All prices per 100 lb. in carload lots, minimum 40,000 lb.

Prices of Raw Materials, Semi-Finished and Finished Products

Ores

Lake Superior Ores, Delivered Lower Lake Ports

Old range Bessemer, 55 per cent iron	$6.45
Old range non-Bessemer, 51½ per cent iron	5.70
Mesabi Bessemer, 55 per cent iron	6.20
Mesabi non-Bessemer, 51½ per cent iron	5.55

Foreign Ore, per Unit, c.i.f. Philadelphia or Baltimore

Iron ore, low phos., copper free, 55 to 58 per cent iron in dry Spanish or Algerian	11½c.
Iron ore, Swedish, average 66 per cent iron	10.50c.
Manganese ore, washed, 51 per cent manganese, from the Caucasus, nominal	45c.
Manganese ore, ordinary, 48 per cent manganese, from the Caucasus	42c.
Manganese ore, Brazilian or Indian, nominal	42c.
Tungsten ore, per unit, in 60 per cent concentrates	$8.50
Chrome ore, basic, 48 per cent Cr_2O_3, crude, per ton, c.i.f. Atlantic seaboard	$18.00 to 28.00
Molybdenum ore, 85 per cent concentrates, per lb. of MoS_2, New York	75c. to 85c.

Ferroalloys

Ferromanganese, domestic, 80 per cent, furnace, or seaboard, per ton	$117.50
Ferromanganese, British, 80 per cent, f.o.b. Atlantic port, duty paid	117.50
Spiegeleisen, domestic, 19 to 21 per cent, per ton, furnace	$45.00 to 47.50
Spiegeleisen, domestic, 16 to 19 per cent, furnace, per ton	44.00 to 46.50
Ferrosilicon, 50 per cent, delivered, per gross ton	82.50
Ferrosilicon, Bessemer, 10 per cent, per ton, furnace	43.50
Ferrosilicon, Bessemer, 11 per cent, per ton, furnace	46.80
Ferrosilicon, Bessemer, 12 per cent, per ton, furnace	50.10
Ferrosilicon, Bessemer, 13 per cent, per ton, furnace	54.10
Ferrosilicon, Bessemer, 14 per cent, per ton, furnace	59.10
Silvery iron, 6 per cent, per ton, furnace	32.00
Silvery iron, 7 per cent, per ton, furnace	33.00
Silvery iron, 8 per cent, per ton, furnace	34.50
Silvery iron, 9 per cent, per ton, furnace	36.50
Silvery iron, 10 per cent, per ton, furnace	38.50
Silvery iron, 11 per cent, per ton, furnace	41.80
Silvery iron, 12 per cent, per ton, furnace	45.10
Ferrotungsten, per lb. contained metal	88c. to 90c.
Ferrochromium, 4 to 6 per cent carbon, 60 to 70 per cent Cr. per lb. contained Cr. delivered	12c.
Ferrochromium, 6 to 7 per cent carbon, 60 to 70 per cent Cr., per lb.	11.50c.
Ferrovanadium, per lb. contained vanadium	$3.50 to $4.00
Ferrocarbontitanium, 15 to 18 per cent, per net ton	200.00

Fluxes and Refractories

Fluorspar, 80 per cent and over calcium fluoride, not over 5 per cent silica, per net ton f.o.b. Illinois and Kentucky mines	$22.00
Fluorspar, 85 per cent and over calcium fluoride, not over 5 per cent silica, per net ton f.o.b. Illinois and Kentucky mines	23.50

Per 1000 f.o.b. works:

Fire Clay:	High Duty	Moderate Duty
Pennsylvania	$48.00 to $51.00	$43.00 to $46.00
Maryland	50.00 to 53.00	45.00
Ohio	45.00 to 47.00	40.00 to 43.00
Kentucky	45.00 to 47.00	42.00 to 45.00
Illinois	48.00 to 50.00	45.00 to 47.00
Missouri	48.00 to 50.00	38.00 to 43.00
Ground fire clay, per net ton	6.50 to	9.50
Silica Brick:		
Pennsylvania	42.00 to	45.00
Chicago		52.00
Birmingham		48.00
Ground silica clay, per net ton		10.00
Magnesite Brick:		
Standard size, per net ton (f.o.b. Baltimore and Chester, Pa.)		65.00
Grain magnesite, per net ton (f.o.b. Baltimore and Chester, Pa.)		40.00
Chrome Brick:		
Standard size, per net ton		50.00

Semi-Finished Steel, f.o.b. Pittsburgh or Youngstown, per gross ton

Rolling billets, 4-in. and over	$42.50
Rolling billets, 2-in. and under	42.50
Forging billets, ordinary carbons	47.50
Sheet bars, Bessemer	42.50
Sheet bars, open-hearth	42.50
Slabs	$42.50
Wire rods, common soft, base, No. 5 to ¼-in.	51.00
Wire rods, common soft, coarser than ¼-in.	$2.50 over base
Wire rods, screw stock	$5 per ton over base
Wire rods, carbon 0.20 to 0.40	$3 per ton over base
Wire rods, carbon 0.41 to 0.55	$5 per ton over base
Wire rods, carbon 0.56 to 0.75	$7.50 per ton over base
Wire rods, carbon over 0.75	$10 per ton over base
Wire rods, acid	$15 per ton over base
Skelp, grooved, per lb.	2.40
Skelp, sheared, per lb.	2.40
Skelp, universal, per lb.	2.40

Finished Iron and Steel, f.o.b. Mill

Rails, heavy, per gross ton	$43.00
Rails, light, new steel, base, per lb.	2.25c.
Rails, light, rerolled, base, per lb.	2.00c. to 2.15c
Spikes, ⅜-in. and larger, base, per 100 lb.	$3.15
Spikes, ½-in., ⅝-in. and ¾-in., base per 100 lb.	$3.25 to 3.75
Spikes, ⅞-in., base, per 100 lb.	3.25 to 3.75
Spikes, boat and barge, base, per 100 lb.	3.50 to 3.75
Track bolts, ⅝-in. and smaller, base, per 100 lb.	4.15 to 4.50
Track bolts, ¾-in. and larger, base, per 100 lb.	4.75 to 5.50
Tie plates, per 100 lb.	2.55 to 2.60
Angle bars, per 100 lb.	2.75
Bars, common iron, base, per lb., Chicago mill	2.50c.
Bars, common iron, Pittsburgh mill	2.40c.
Bars, rails, steel reinforcing, base, per lb.	2.15c. to 2.25c.
Ground shafting, base, per lb.	3.65c.
Cut nails, base, per keg	$3.25

S. A. E. Semi-finished Castellated Nuts and U. S. S. Semi-finished Slotted Nuts

(To jobbers and consumers in large quantities f.o.b. Pittsburgh)

	Per 1000	
	S. A. E.	U. S. S.
¼-in.	$4.80	$4.80
⅜-in.	5.50	6.00
⅝-in.	6.50	7.00
⅞-in.	9.00	9.50
½-in.	11.00	11.50
⅝-in.	15.00	15.00
¾-in.	19.50	20.00
⅞-in.	28.50	28.50
1 in.	37.00	37.50
1⅛-in.	58.50	60.50
1¼-in.	88.00	97.00
1⅜-in.	132.00	132.00
1½	176.00	176.00
	220.00	220.00

Larger sizes—Prices on application

Alloy Steel

S.A.E. Series Numbers	Bars 100 lb.
2100*(½% Nickel, 10 to 20 per cent Carbon)	$3.25 to $3.50
2300 (3½% Nickel)	5.25 to 5.50
2500 (5% Nickel)	7.75 to 8.00
3100 (Nickel Chromium)	4.25 to 4.50
3200 (Nickel Chromium)	6.00 to 6.25
3300 (Nickel Chromium)	8.00 to 8.25
3400 (Nickel Chromium)	7.00 to 7.25
5100 (Chromium Steel)	3.75 to 4.00
5200*(Chromium Steel)	8.00 to 8.25
6100 (Chormium Vanadium bars)	5.00 to 5.25
6100 (Chromium Vanadium spring steel)	4.75 to 5.00
9250 (Silico Manganese spring steel)	3.75 to 4.00
Nickel Chrome Vanadium (0.60 Nickel, 0.50 Chromium, 0.15 Vanadium)	5.25 to 5.50
Chromium Molybdenum bars (0.80—1.10 Chromium, 0.25—0.40 Molybdenum)	4.50 to 4.75
Chromium Molybdenum bars (0.50—0.70 Chromium, 0.15—0.25 Molybdenum)	4.25 to 4.50
Chromium Molybdenum spring steel (1—1.25 Chromium, 0.30—0.50 Molybdenum)	4.25 to 4.50

Above prices are for hot-rolled alloy steel bars, forging quality, per 100 lb. f.o.b. Pittsburgh. Billets 4 x 4 in. and larger are $10 per gross ton less than net ton price for bars of same analyses. On smaller than 4 x 4-in. billets down to and including 2½-in. sq. there is a size extra of $10 per gross ton; on billets smaller than 2½-in. sq., the net ton bar price applies.

*Not S.A.E. specifications, but numbered by manufacturers to conform to S.A.E. system.

FABRICATED STEEL BUSINESS

Awards Again More Than 16,000 Tons While Total of Inquiries Falls

Private building projects make up the bulk of the fabricated steel purchases of the past week, all but 1300 tons of the 16,200 tons bought being of this general classification. Not much over 6500 tons of new projects came to light for figures. The awards are as follows:

Office building in Grand Central Station area, New York, Todd, Robertson & Todd, general contractors, 7500 tons, to Post & McCord and American Bridge Co.

Elizabeth Journal Building, Elizabeth, N. J., 650 tons, to Hedden Iron Construction Co.

Press Publishing Co. building, Frankfort Street, New York, 600 tons, to Harris Structural Steel Co.

Bank of the Manhattan Co., addition in Wall Street, New York, 200 tons, to Eidlitz & Ross.

Nassau Smelting & Refining Co., plant at Tottenville, Staten Island, 300 tons, to Levering & Garrigues Co.

Evening Bulletin Building annex, Philadelphia, 1100 tons, to Jones & Laughlin Steel Corporation.

Grade elimination work at Great Meadows, N. J., 200 tons, to Bethlehem Steel Bridge Corporation.

Wheeler Building, Bridgeport, Conn., 400 tons, to Bethlehem Fabricators, Inc.

Apartment building at 1009 Park Avenue, New York, 600 tons, to Hay Foundry & Iron Works.

Apartment building on Eighty-ninth Street, New York, 400 tons, to Hay Foundry & Iron Works.

Apartment building, Buffalo, N. Y., 1500 tons, Dwight P. Robinson & Co., general contractors, awarded to unnamed fabricator.

Chicago Motor Bus Co., Chicago, garage, 1000 tons, to Gage Structural Steel Co.

First National Bank Building, Davenport, Iowa, 423 tons, to American Bridge Co.

Municipal building, Chisholm, Minn., 126 tons, to American Bridge Co.

Bridges for State of Illinois, 744 tons, to International Bridge Co. and other fabricators.

Drawbridge for city of Saginaw, Mich., 225 tons, to Wisconsin Bridge & Iron Co.

Ninth-Vincent Building, Cleveland, 200 tons, to Massillon Bridge & Structural Co.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

General Baking Co. building, Waterbury, Conn., 200 tons.

Power plant at Buffalo, N. Y., to be erected by the Du Pont Engineering Co. for a client, 400 tons.

Southern Railway, viaduct in Virginia, 300 tons.

Pennsylvania Sugar Co., warehouse, Philadelphia, 1500 tons.

Baltimore & Ohio Railroad, bridge, 250 tons.

Louisville & Nashville Railroad, bridge work, 1600 tons, bids close Aug. 16.

McCall Publishing Co., printing plant, Dayton, Ohio, 500 tons, bids taken.

Texas Oil Co., two 55,000-bbl. oil storage tanks, 600 tons, bids being taken.

Detroit Institute of Arts, 1500 tons.

RAILROAD EQUIPMENT BUYING

No Car or Locomotive Purchases Reported, but New Car Inquiries

Railroad buying for motive power and rolling stock is largely for repair purposes, involving a large tonnage of steel but not in amounts for individual orders of a size to attract particular attention. No new equipment appears to have been bought in the past week, but fresh inquiries came into the market for 2160 cars. The chief items of interest are the following:

The Chesapeake & Ohio Railroad will inquire shortly for bids on repairing 1500 steel cars.

The Montour Railroad is in the market for 500 50-ton hopper coal cars.

Inquiries for freight cars which have been pending for some weeks are as follows: Erie Railroad, 498 coke cars to be converted into box cars; Canadian National Railways, 1000 box cars; Delaware, Lackawanna & Western, 200 refrigerator cars; Standard Oil Co., 10 gondolas; New York, Ontario & Western, 16 caboose car underframes; Minnesota Steel Co., 44 hopper cars; Santa Fe, 300 50-ton gondolas and 200 50-ton flat cars.

The Chicago & Alton is inquiring for 610 gondola cars and 250 automobile cars.

The Chicago & Northwestern has placed 100 center sills with the Western Steel Car & Foundry Co.

The Union Pacific is inquiring for 250 tank cars.

The Roxanna Petroleum Co., St. Louis, is in the market for 350 tank cars.

The Lake Superior & Ishpeming is inquiring for 200 steel ore cars of 50 to 75 tons capacity.

Better Conditions Reported from Youngstown

YOUNGSTOWN, Aug. 14.—Somewhat broadened sheet mill operation this week is the principal change in production schedules of Valley iron and steel plants. A district producer of reinforcing steel bars reports firm inquiry, with western demand offsetting loss in requirements due to letdown of roadbuilding demand in the East. Black sheet requirements are coming in more steadily, makers in this territory assert, at least as compared with July demand.

The General Fireproofing Co., maker of metal furniture and safes, reports July business was better than that of June, but that sales in several previous months exceeded the figures in both months referred to. The company has business in hand sufficient to insure capacity operations for some time.

Broader sheet mill operations are reported by the Youngstown Sheet & Tube Co., Sharon Steel Hoop Co. and Falcon Steel Co., this week.

Of the 51 independent open-hearth furnaces in the district, 44 are melting.

Active sheet mills this week are divided as follows: Youngstown Sheet & Tube Co., 27 mills, 12 at East Youngstown, 7 at Niles and 8 at Warren; Newton Steel Co., 17 mills; Trumbull Steel Co., 15; Republic Iron & Steel Co., 8; Sharon Steel Hoop Co. and Mahoning Valley Steel Co., 7 each and Falcon Steel Co., 6, or a total of 87 of the 115 mills in the Mahoning Valley.

Youngstown Sheet & Tube Appointments

The Youngstown Sheet & Tube Co., Youngstown, announces these appointments:

B. M. Stubblefield, superintendent of the by-product coke works at East Youngstown. He was previously assistant superintendent under Emil F. Vogel, advanced to assistant works superintendent.

J. F. Regan, assistant superintendent of the East Youngstown coke plant.

G. C. Williams, superintendent of the by-product coke plant at the Brier Hill works. He has been in charge of this department under Mr. Vogel.

F. D. Schreiber, assistant superintendent of the Brier Hill coke plant.

The Mining, Iron and Machine Association reports that the iron and steel production in Austria for the first quarter of 1923 was as follows: Steel-making pig iron, 71,212 metric tons; foundry pig iron, 21,479 tons; Bessemer steel, 11 tons; open hearth steel, 84,520 tons; puddled iron, 87 tons; puddled steel, 187 tons; refined steel, 7753 tons; finished products: Iron bars, 20,811 tons; steel bars, 9333 tons; girders, 2958 tons; rails, 5003 tons; sheet iron, 1021 tons; sheet steel, 694 tons, and rolled wire, 17,409 tons.

NON-FERROUS METALS

The Week's Prices

Cents per Pound for Early Delivery

	Copper, New York		Straits Tin	Lead		Zinc	
Aug.	Lake	Electrolytic*	New York	New York	St. Louis	New York	St. Louis
8.....	14.62½	14.00	38.87½	6.70	6.55	6.50	6.15
9.....	14.62½	14.00	38.87½	6.70	6.50	6.50	6.15
11.....	14.50	14.00	....	6.70	6.45	6.55	6.20
13.....	14.50	13.87½	38.25	6.70	6.40	6.60	6.25
14.....	14.50	13.87½	38.50	6.70	6.35	6.60	6.25

*Refinery quotation; delivered price ¼c. higher.

New York

NEW YORK, Aug. 14.

The markets are extremely inactive and in some there is hardly enough business to establish prices. The copper market has declined, with buying extremely light and the tin market has been inactive but fairly firm. Demand for lead is light, with prices easier in the West. The zinc market has advanced slightly. Friday, Aug. 10, no markets were open because of the President's funeral.

Copper.—Consumers still refrain from entering the market, although inquiries from some of them are fairly large. There has also been considerable slackening in export sales, due to unsettled conditions in Europe. Under these conditions the price of electrolytic copper has gradually sagged until it is freely admitted that desirable business can be placed at 14.12½c., delivered, at which level some business has been done. Lake copper is also lower at 14.50c., delivered.

Tin.—The Straits tin market is quiet but the tone is firm. There has been almost a complete absence of pressure to sell from any source, dealers not even being active. There are predictions that, if the price goes above 39c., there will be a renewal of short selling and, if it falls below 38c., good buying will follow. Undoubtedly the foreign political and economic situation is affecting both buyers and sellers in the London and New York markets. There was very little activity in yesterday's or today's markets and the quotation for spot Straits tin was 38.50c., New York. London quotations today were £1½ per ton higher than a week ago at £183 for spot standard, £184 for future standard and £186 10s. for spot Straits. Arrivals thus far this month have been 2370 tons, with the quantity afloat 5927 tons.

Lead.—There is a marked absence of inquiry and the market is in the midst of seasonal activity. The only change of consequence has been an easing in the Western market and prices have fallen nearly each day until lead for shipment from the West has sold on a basis of 6.35., St. Louis, for Eastern delivery. The New York price in the outside market is 6.70c., with the price of the leading interest unchanged at 6.50c., New York.

Zinc.—The chief news item of the week has been the publication of the July statistics of the American Zinc Institute which show an increase of 4067 tons of stocks in smelters' hands, the tonnage on hand July 31 having been 2124 tons. There was a slight increase in output, but the shipments kept up well considering the fact that July was a dull month so far as consumption was concerned. In spite of this the price of prime Western has advanced about 10 points to 6.25c., St. Louis, or 6.60c., New York. This is due partly to the continued high price of ore, to demand from dealers and to a disinclination of producers to sell. Demand from galvanizers is still very light.

Nickel.—Quotations for shot and ingot nickel are unchanged at 29c. to 32c. per lb., with electrolytic nickel held at 32c. by the leading producers. Quotations for shot and ingot nickel in the outside spot market are 29c. to 32c. per lb.

Antimony.—The market is quiet but firm, with Chinese metal in wholesale lots quoted at 7.87½c., New York, duty paid.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is quoted by importers, who can obtain it from their principals, at 26.50c. to 27c., New York, duty paid, in wholesale lots. No quotations are made public by the leading domestic producer.

Old Metals.—The market continues depressed and prices are easier. Dealers' selling prices are as follows:

	Cents Per Lb.
Copper, heavy and crucible	13.75
Copper, heavy and wire	12.75
Copper, light and bottoms	10.75
Heavy machine composition	10.75
Brass, heavy	7.75
Brass, light	6.50
No. 1 red brass or composition turnings	9.00
No. 1 yellow rod brass turnings	7.50
Lead, heavy	5.75
Lead, tea	4.75
Zinc	4.75

Chicago

CHICAGO, Aug. 14.—Copper and lead have declined while zinc has advanced. The market is still generally quiet, although some little business in copper has been placed at concessions and tin was fairly active for a few days last week until advances stifled further buying. Zinc appears to be firmer than the other metals. Among the old metals, copper grades have declined while tin grades have advanced. We quote in carload lots, Lake copper, 15c.; tin, 40c.; lead 6.45c; spelter, 6.30c.; antimony, 9c., in less than carload lots. On old metals we quote coper wire, crucible shapes and copper clips, 11.25c.; copper bottoms, 9.50c.; red brass, 8.50c.; yellow brass, 6c.; lead pipe, 4.75c.; zinc, 4c.; pewter, No. 1, 20c.; tin foil, 24c.; block tin, 30c.; all buying prices for less than carload lots.

Standard Tin Plate Specifications

WASHINGTON, Aug. 14.—Large attendance is expected at the meeting to be held tomorrow at the Bureau of Standards concerning specifications for tin plate. It will be attended by tin plate manufacturers, can makers, representatives of the National Canners' Association and other users of tin can containers. As pointed out in THE IRON AGE of June 28, page 1863, the National Canners' Association in developing the movement to set standards of tin plate filed a brief with the Bureau of Standards in which it criticised the quality of this product. Producers are expected to challenge this view strongly. Among other things, complaint is made that the tin coating lacks uniformity and request is made that a definite standard for the amount of tin coating should be established. The Bureau of Standards, however, proposes to listen to the contentions of the different sides and to provide help in arranging standards, only in the event this is agreeable to all concerned.

World Trade in Rubber Belting

WASHINGTON, Aug. 14.—Trade in rubber and balata belting has increased steadily since 1921, reflecting increased industrial and mining activity throughout the world, according to E. G. Holt, assistant chief of the rubber division of the Department of Commerce. At present United States manufacturers are the leading suppliers to foreign importers, with the United Kingdom a close second. While the volume of American exports exceeds that of British exports, the British product sells at a much higher price in world markets, which, Mr. Holt says, might account for the growing popularity of the American lines. The exports of rubber and balata belting from the principal manufacturing countries in 1922 totaled approximately 7,000,000 lb., and had a value of about $4,500,000. During 1922, the United States supplied approximately 37 per cent by volume of the total world export trade in rubber and balata belting. The United Kingdom secured about 34 per cent; France, 12 per cent; Germany, 9 per cent; Canada, 5 per cent, and Norway, 2 per cent.

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Scarcity of Material for Export—Foundry Iron Inactive, but Curtailed Production Bolsters Prices

ANTWERP, BELGIUM, July 27.—Demand continues strong and in consequence the market is firm. Prices are much higher. The following prices are quoted today for domestic consumption per metric ton, f.o.b. trucks at maker's works:

	Fr.	Equivalent
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Commercial iron No. 3	775	37.80
Commercial iron No. 4	875	42.60
Heavy sheets	750	36.60
Thin sheets	1,100	53.60
Bars	725	35.40
Rails	700	34.00
Heavy beams	700	34.00
Pickets	715	34.75
Open-hearth steel—		
Ordinary	725	35.40
Half hard	900	44.00
Mild	800	39.00
Special	1,050	51.20
Rounds	1,400	68.20
Spring steel	1,350	55.00
Bessemer ingots	560	27.40
Blooms	590	28.80
Billets	630	30.75
Largets	650	31.75

Luxemburg works are offering semi-finished products in Belgium as follows per metric ton:

	Luxemburg		Lorraine	
	Fr.		Fr.	
Ingots	570	$27.80	570	$27.80
Blooms	600	29.25	600	29.25
Billets	645	31.40	650	31.75
Largets	660	32.20	670	32.75

The rate of exchange is about 20.50 Belgian francs to the $1. As this rate is even higher than the rate early in the month, the foregoing prices show clearly the decided increase of price. Early in July commercial iron No. 2 and bars were quoted at $32.50, billets at $28.75 and rails at $31.25. Steel billets are scarce. A few lots have been offered this week for export at a price close to 140s., or 660 fr. at present exchange $32.20. Demand is plentiful and all offerings are quickly taken. Ingots and blooms are available in larger quantities, but in general the quotations follow the same advance. The largest business has been done in bars. For export it is now quite impossible to obtain any quantity at the quoted price of $35.40 per ton, f.o.b. Antwerp. Rolled products are practically out of the export market even at prices much higher than the nominal quotation. Rods are quoted for domestic consumption at 900 fr. per ton (or $0.44). In general the situation is considered satisfactory and works are in most cases booked up to September.

The export of scrap iron is not yet permitted, but even if foreign sales were possible no large sales could be made abroad as domestic prices are rising rapidly. Foundry scrap is now about 430 fr. per ton ($21) and open-hearth material 320 fr. ($15.60).

The demand for foundry pig iron is not large. Prices, however, are high as the production is only sufficient to cover the requirements of regular customers. Prices are largely nominal:

	Fr.	
High phosphorus foundry iron No. 3	480	$23.40
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Lorraine high phosphorus foundry iron is offered in Belgium at 480 to 500 fr. ($23.40 to $24.50), free at consumer's works. This price is also quoted f.o.b. Antwerp, but only for large tonnages and delayed shipments. Exporters would, it is believed, book orders at lower prices as in many quarters there is the impression that the market on foundry pig iron may be expected to decline as a result of the decreased demand for foundry pig iron. Belgian hematite pig iron is quoted at 520 fr. ($25.40). British hematite has been rather inactive because of the high rate of exchange. Business, however, may improve. British domestic prices are declining. East Coast makers are offering hematite as low as 108s., c.i.f. Antwerp (510 fr.). This quotation is based on 102s. per gross ton f.o.b. works, England. With this reduction of British prices, it is no longer possible to export Belgian foundry iron to England and Scotland. In fact, a price of 480 fr. f.o.b. Antwerp for high phosphorus foundry iron is equal to 102s., or about 110s., c.i.f. United Kingdom port. This price is too close to the nominal Scotch prices and is even higher than the quotation on Middlesborough foundry, No. 3. The latter was lately offered at 112s. to 115s., c.i.f. Antwerp, and Scotch foundry No. 3 was quoted at 115s. to 118s.

Coke is firm, prices remaining about the same. Production, although larger, is not sufficient to cover requirements. During the past month about 340,000 tons of coke was produced from 446,000 tons of coal. Of the total coal consumed about 203,000 tons was Belgian and 243,000 tons imported.

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NEW TRADE PUBLICATIONS

Lock Washers.—The American Nut & Bolt Fastener Co., Ontario and Doerr Streets, Pittsburgh. Catalog No. 3 sketches the tempering process applied to American Lock Washers. Various patterns are illustrated and appear in sectional drawings. Specifications are given on S. A. E. standard bolts and machine screws. Other data appear together with price lists and simplified telegraphic code for ordering. Size 32 pages, 6 x 9 in.

Lamp Maintenance Hangers.—The Thompson Electric Co., 226 St. Clair Avenue, N. E., Cleveland. Supplement to catalog B-21, showing methods of wiring and lamp installation which eliminate climbing, reflectors being accessible from the floor for frequent cleaning.

Washers.—The American Nut & Bolt Fastener Co., Pittsburgh. Folder No. 8 gives manufacturers' standard list of wrought, square and axle washers, with dimensional data. Size 6 pages, 3 x 6 in.

Stowe Stoker.—LaClede-Christie Clay Products Co., St. Louis. A 16-page catalog describing a chain grate stoker of the sloping type with conveyor feed and designed for the use of mechanical draft. Its distinctive design includes stationary tuyeres, alternating with moving chains and a fuel retarding arrangement at the point where ash is discharged. These units effect a closely massed fuel bed of uniform thickness. Along with this catalog is an 8-page pamphlet giving results of tests of burning Pocahontas coal on Stowe stokers at the plant of the Gloucester Electric Co., Gloucester, Mass. There were four 250-hp. Babcock and Wilcox boilers which were operated at about 220 per cent of rating. The average gas analysis over a long period was given as 14 per cent CO_2, with combustibility in the ash running less than 10 per cent.

Thread Grinding Attachment.—Precision & Thread Grinder Mfg. Co., Philadelphia. Booklet of 25 pages describing and illustrating the use and features of the company's multi-graduated precision grinder and precision thread lead variator, designed for use in the manufacture of thread gages, taps, hobs, dies, chasers and used also in cylindrical and internal grinding. The variator controls the lead. A page is devoted to a comparison between lapping and grinding operations on this work. Instructions for setting up and operating the devices are given and several installations shown.

Wire Baskets.—John P. Smith & Co., New Haven, Conn. Booklet illustrating a variety of iron and galvanized, brass and copper, aluminum, monel metal and calido wire baskets for dipping, plating and heat treating. Directions for specifying the size of the wire cloth, mesh, space, and gage, are given. Size 4 x 6¾ in., 44 pages.

Lifting Magnets.—Cutler-Hammer Mfg. Co., Milwaukee. Publication No. 3015. Construction features of CH high duty lifting magnets are outlined and component parts illustrated. Methods of control are shown, and lifting capacities given. The illustrations include several views of the equipment in actual use.

Portable Electric Drills and Reamers.—Hisey-Wolf Machine Co., Cincinnati. Bulletin No. 106 describes the general construction and specifies sizes and capacities of universal motor hand drills, universal motor drills and direct current drills and reamers. Pages are devoted to drilling stands and electric drill attachments and accessories.

Riveting Hammers.—High Speed Hammer Co., Inc., Rochester, N. Y. Catalog C, 24 pages, 7¾ x 10¾ in. Describes and illustrates in half tones and line cuts various sizes and types of the company's riveting hammers. The illustrations are unusually large and clear. Several types of peins, anvils and drifts available are also shown, as well as the Model E 50 motor-driven sensitive bench drill press, for both tool room and production work.

Industrial Locomotives. — Bloomsburg Locomotive Works, Bloomsburg, Pa. Bulletin No. 137, 28 pages. The features and details of construction of the company's gasoline locomotives are described and illustrated, complete specifications also being given. Smokeless types of steam locomotives and steam-driven geared locomotive, oil burning, are likewise described. A table showing hauling capacities is included.

Air Compressors.—Ingersoll-Rand Co., 11 Broadway, New York. Booklet of 35 pages devoted to a description of the Imperial type XPV duplex steam-driven air and gas compressors. Distinctive features include use of balanced piston steam valves, an automatic cut-off oil pressure governor of the speed and pressure type, and the use of I-R plate valves for intake and discharge in air cylinders. The booklet is profusely illustrated.

Multistage Centrifugal Pumps.—De Laval Steam Turbine Co., Trenton, N. J. Catalog H, 8½ x 11 in., 20 pages. Features of the company's multistage series pumps, in which double suction impellers and volute diffusers are used, as in single-stage centrifugal pumps, are outlined. The connecting passages from stage to stage are, however, included in the pump case casting. The advantages claimed are hydraulic axial balance and high efficiency under varying loads. The pumps are made with two or three stages, and in the case of more than three stages, the use of two pumps operating in series and on the same base plate is recommended.

Oil Burning Equipment.—Tate-Jones & Co., Pittsburgh. Bulletin No. 172, devoted to auxiliary equipment for oil burners and includes oil pumping systems, fuel oil heaters, rotary gear type oil pump, pressure blowers, shut-off valves, air blast gates, and oil burners. General hardening furnaces and gas oven furnaces are also described.

Combustion Units.—Duquesne Burner Service Co., Pittsburgh. A 32-page catalog, with numerous halftones and diagrams, devoted to the efficient utilization of natural gas through the use of burners particularly designed for it. These are low-pressure burners for use in boilers with capacities from 5 to 500 hp. The unit is so arranged that it can be used also as a combination gas and oil burner. Its greatest advantage is stated to be eliminating guess work on the part of the foreman, thus securing maximum furnace efficiency on varying loads.

Gwynn Type E Gas Burners.—Duquesne Burner Service Co., Pittsburgh. 64-page catalog illustrating and describing burner equipment for natural gas, including combined rotary air damper, detachable nozzles, etc. The burners are supplied with three controlling valves and are arranged for automatic regulation. They are designed for low-pressure steam heating apparatus and for constant fuel consumption.

Bradshaw Burner.—Gas Combustion Co., Pittsburgh. 24-page catalog dealing with a burner for the efficient utilization of blast furnace gas when used in boilers or hot blast stoves. It is also designed for use as a burner of producer gas. A variant is the Bradshaw pressure burner, designed to obtain for the generation of steam additional gas that is now ordinarily wasted in the hot blast stoves. The burners are designed to hold constant that ratio of gas to air decided upon as most efficient in each particular case.

Falls Automatic Engine Stop.—Gas Combustion Co., Pittsburgh. 24-page catalog illustrating and describing three types of engine stop control—electrical closed circuit, electrical open circuit and mechanical. The electrical equipment is designed for either alternating or direct current. A particular feature is the ability of the stop to shut down an engine quickly in case of any such release of energy as is caused by a fly wheel rupture. This prevents wrecking the engine and conserves safety of those in the engine room.

Recording Wind Velocity.—Esterline-Angus Co., Indianapolis. An 8-page pamphlet, Bulletin 623, describes the use of a recording anemometer at the plant of the Minnesota Steel Co., Duluth. The large areas of the cranes and ore bridges, etc., opposed to the heavy winds of that district, make it essential to guard against trouble. The graphic record permits study of the wind conditions and corresponding safeguarding of apparatus and men.

Low Pressure Mechanical Oil Burning.—Coen Co., Inc., 112 Market Street, San Francisco. Bulletin L of 40 pages and cover describes a system of burning oil without the use of steam or compressed air for atomizing purposes. It consists, primarily, of an oil pumping set, oil heaters, duplex suction and discharge strainers and the necessary burners. The bulletin is fully illustrated and contains a large amount of tabular matter.

Portable Tools.—Stow Mfg. Co., Inc., Binghamton, N. Y. Pamphlet G-3. Outlines features and gives dimensions of the company's portable buffer and grinder, direct connected, and combination grinder and drill for die sinking, which is available for specific work or combination.

Chain Drive Data.—Diamond Chain & Mfg. Co., Indianapolis. Loose-leaf booklet of 16 pages giving charts and information on the design and application of roller chain drives. A description of the new standard sprocket tooth form approved by the ASME is included. A chart designed to aid in the selection of chains and sprockets is given, as well as tables showing hp., working loads and speeds and other useful data.

Machinery Markets and News of the Works

MORE RAILROAD BUSINESS

Elgin, Joliet & Eastern Places Large Orders at Chicago

Willys-Morrow Co., Elmira, N. Y., Buying Considerable Number of Automatic Machines

Notwithstanding the general quietness of demand for machine tools by industrial plants, there is still a fair volume of railroad business. The Elgin, Joliet & Eastern has distributed orders at Chicago for about $100,000 worth of shop equipment and word comes from Detroit that the Pere Marquette is placing orders there against its recent list. The Illinois Central has bought several items at Chicago. Some American tool builders are asked to quote on a list of about 20 tools for the Canadian National Railways.

The Norfolk & Western has placed a number of orders with Cincinnati builders and the recent small list of the Southern Railway has been purchased. The Seaboard Air Line and the Virginian Railway are expected to be in the market shortly. At Pittsburgh the principal business in sight is represented in the pending lists of the Baltimore & Ohio and the Pennsylvania Railroad, Central Region, but there are no definite indications as to when orders will be placed. The Mobile & Ohio has issued a small list of miscellaneous tools.

Testimony to continued activity in the automobile trade is afforded by the purchase of $100,000 worth of automatic machines by the Willys-Morrow Co., Elmira, N. Y., affiliated with the Willys-Overland automobile interests. It is likely that the purchases, when completed, will run $200,000 or more.

The State of Michigan, which recently inquired for 15 lathes for the University of Michigan, is reported to have bought at least a part of this number. The Borough of Manhattan is in the market for a few tools.

New York

NEW YORK, Aug. 14.

THERE are a few bright spots in the machine tool situation but only a few tool manufacturers are being benefited. Taking the Eastern district as a whole, business is quiet and unsatisfactory in volume. The Willys-Morrow Co., Elmira, N. Y., has expended $100,000 or more for automatic machines, and its total investment will probably reach $200,000. The purchase includes Bullard, Lodge & Shipley and Potter & Johnson automatic machines. The Canadian National Railways are asking a few people in this market to bid on about 20 items on a new list for one of its shops, but it is likely that most of the equipment will be bought in Canada. The Brooklyn Union Gas Co. has purchased a 24-in. shaper, a 12-in. pipe machine, a 4-ft. radial drill, a 20-in. upright drill and a tool grinder from a local machinery dealer. The Pennsylvania Railroad has bought a 36-in. lathe.

The Eclipse Machine Co., Elmira, N. Y., announces through its Hoboken, N. J., plant that it has taken over the plant, equipment and business of the Bijur Motor Appliance Co., Hoboken, N. J., and the name of the latter company has been changed to the Bijur Lubrication Corporation. Some of the machine-tool equipment in the Bijur plant is being offered for sale.

The A. C. Chesley Co., Inc., 704 East 133rd Street, New York, manufacturer of hollow metal fireproof doors, windows, etc., has plans for the erection of a one-story addition, 130 x 200 ft. F. J. Murray, 141 East Fortieth Street, is architect.

The W. N. Best Corporation, recently organized under New Jersey laws, has taken over the plant and business of the W. N. Best Furnace & Burner Corporation, 11 Broadway, manufacturer of oil-burning equipment, annealing and other furnaces, etc., and plans for extensions. Joseph D. Sears is president and A. H. Best, vice-president.

The United Electric Light & Power Co., 12 West Tenth Street, New York, has plans for a new one-story power house, 60 x 105 ft., on Locust Avenue, near 134th Street, estimated to cost $80,000. Thomas E. Murray, 55 Duane Street, is architect. F. W. Smith is president.

The Union Carbide & Carbon Corporation, 30 East Forty-second Street, New York, has arranged an appropriation of more than $5,000,000 for extensions in its plants in different parts of the country, including the installation of additional machinery. The Linde company division is commencing the erection of a new plant at Tulsa, Okla., of which the first unit will cost about $250,000, with equipment.

The Davis Equipment Co., Inc., 50 Church Street, New York, is in the market for three 300-hp. water tube boilers and one 450 reciprocating or Corliss engine. The boiler should be suitable for attaching an underfed type stoker.

The Atlantic Industrial Alcohol Co., New York, care of Floyd S. Corbin, 300 Madison Avenue, has acquired 17 acres on the Arthur Kill Road, Tottenville, S. I., as a site for a new plant. Three buildings will be erected, 80 x 350 ft., 80 x 240 ft., and 80 x 160 ft. A dock, with pumping and other machinery will also be built. The cost is estimated at $200,000.

Manual training equipment will be installed in the three-story and basement junior high school to be erected at Amsterdam, N. Y., estimated to cost $450,000, for which bids are being received on a general contract. Niles & Daly, Amsterdam, are supervising architects.

A machine shop will be installed in the five-story automobile service building, 100 x 100 ft., to be erected at 111-17 West Eighty-ninth Street, New York, estimated to cost $500,000, for which plans are being drawn by Louis Brooks, 17 East Forty-fifth Street, architect. The owner's name is temporarily withheld.

The International Combustion Engineering Corporation, 43 Broad Street, New York, has closed negotiations for the purchase of the plants of the Raymond Brothers Impact Pulverizer Co. and the Raymond Brothers Engineering Co., Chicago, affiliated organizations, specializing in the manufacture of pulverized fuel systems and pulverizing machinery. The new owner has called a special meeting of stockholders, Sept. 7, to arrange for an increase in capital from 250,000 to 450,000 shares of capital stock, the proceeds to be used for the purchase and for extensions and improvements.

The Brooklyn Union Gas Co., 176 Remsen Street, Brooklyn, has plans for a one-story steam power house, 48 x 69 ft. at 44-46 Fifth Street, to cost about $80,000.

The Queens Gas & Electric Co., Flushing, L. I., will commence the erection of a new power plant to cost $90,000.

In connection with the purchase of the plants and business of the Cox Brothers Mfg. Co., Albany, N. Y., and Cleveland, manufacturer of automobile bumpers, by the Eaton Axle & Spring Co., Cleveland, the new owner is planning the establishment of branches at Philadelphia and Boston, as well as service and repair works at Cleveland and Albany.

The Willys-Overland Co., 1631 Broadway, New York, with plant at Toledo, Ohio, has tentative plans for additions for the production of Willys-Knight automobiles and parts, to provide for an increase of about 50 per cent in output. The expansion will be carried out late in the present year and early in 1924. John N. Willys is president.

The Municipal Improvement Corporation, 32 Court Street, Brooklyn, will build a one-story machine and repair shop at Jamaica, L. I., to occupy a portion of a building, 80 x 190 ft.

The Crane Market

Business in both overhead and locomotive cranes has been quiet the past week with few new inquiries reported and only a few orders placed. The Brooklyn Edison Co., Brooklyn, N. Y., is believed to have closed this week on the 25-ton overhead traveling crane that has been pending for some time. Among late inquiries is one from the United Shoe Machinery Co., Beverly, Mass., for a 15-ton, 28-ft. span electric traveling crane. The New York Steel Exchange, 233 Broadway, New York, has been receiving bids on two 30-ton hand power cranes, 23-ft. 2-in. and 22-ft. spans, for export to South America. Quick delivery is required and the prospective purchaser is willing to consider offers of used equipment. An inquiry which is fairly widespread among sellers of used equipment is from a Canadian company and asks for quotations on a used 75-ton wrecking crane. The General Electric Co., Schenectady, N. Y., is reported to have revived an old inquiry for an overhead crane.

Among recent purchases are:

Phoenix Utility Co., 71 Broadway, New York, two 2-ton, single I-beam electric cranes from the Whiting Corporation.

United Towns Electric Co., St. Johns, Newfoundland, a 10-ton, 30-ft. span hand power crane from the Whiting Corporation.

Walworth Mfg. Co., Boston, Mass., a 5-ton, 75-ft. span electric traveling crane, purchased in Chicago for Chicago plant, from the Milwaukee Electric Crane & Mfg. Co.

Ruberoid Co., Bound Brook, N. J., a 3-ton, single I-beam electric crane from the Shepard Electric Crane & Hoist Co.

Miehle Printing Press & Mfg. Co., Chicago, six 1-ton, suspended type, 17-ft. span, 2-motor electric traveling cranes from the Roeper Crane & Hoist Works.

Grantie Sheds Co., Elberton, Ga., a 5-ton, 27-ft. span, hand power crane from the Roeper Crane & Hoist Works.

Reading Steel Casting Co., Reading, Pa., a 1-ton, 20-ft. span hand power crane from the Roeper Crane & Hoist Works.

Pennsylvania Tank Car Co., Sharon, Pa., a 3-ton electric hoist from the Roeper Crane & Hoist Works.

Ajax Paper Co., Buck Run, Pa., a 1-ton electric hoist from the Roeper Crane & Hoist Works.

Sidney Blumenthal & Co., Shelton, Conn., a 2-ton, 1-motor, overhead traveling crane from the Roeper Crane & Hoist Works.

Mount Pleasant Foundry Co., Mount Pleasant, Pa., a 20-ton hand power crane from the Whiting Corporation.

Mees & Mees, Charlotte, N. C., a 15-ton hand power crane from the Whiting Corporation.

Rhinelander Light & Power Co., Rhinelander, Wis., a 10-ton hand power crane from the Whiting Corporation.

Canadian National Railways, Toronto, Ont., a 20-ton electric traveling crane from the Whiting Corporation.

Westinghouse Electric & Mfg. Co., West Pittsburgh, Pa., a 5-ton and 6-ton hand power crane from the Whiting Corporation.

American Sash Weight Foundry Co., Davenport, Iowa, a 5-ton hand power crane from the Whiting Corporation.

Akron, Canton & Youngstown Railroad, Akron, Ohio, a 10-ton hand power crane from the Whiting Corporation.

Kendallville Foundry Co., Kendallville, Ind., a 5-ton hand power crane from the Whiting Corporation.

Seelig & Finkelstein, 44 Court Street, Brooklyn, are architects.

The Perfect Service Auto Sales Corporation, 142 East 120th Street, New York, has leased the three-story building, 99 x 100 ft., at 528-40 West 162d Street, for a new service and repair works.

The Metal Stamping Co., Thirteenth Street, Long Island City, has acquired through its president, John F. Galvin, property in the vicinity of its plant at Fourteenth Street and the Boulevard for future expansion.

The Continental Can Co., 61 Broadway, New York, with main plant at Syracuse, N. Y., has preliminary plans for the erection of an addition to its plant on Fifteenth Street, Jersey City, N. J., estimated to cost $500,000 with equipment.

Manual training equipment will be installed in the four-story high school to be erected at Clifton, N. J., estimated to cost $500,000, for which bids will soon be asked on a general contract. Lee & Hewitt, 152 Market Street, Paterson, N. J., are architects.

The Standard Oil Co. of New Jersey, 26 Broadway, New York, has plans for an addition to its refinery at Linden, N. J., to cost about $300,000, with equipment.

The Crocker-Wheeler Co., Fourth Avenue, Ampere, N. J., manufacturer of electrical machinery, will build a one-story addition to its power house.

David Neal, Bernardsville, N. J., and associates, have purchased the Bernardsville Electric Co. and plans for extensions in the plant and system.

Manual training equipment will be installed in the new high school to be erected at Madison, N. J., estimated to cost $300,000, for which bids will be called on a general contract at an early date. Frederick A. Miller is president of the Board of Education.

The Keystone Watch Case Co., 113 North Thirteenth Street, Newark, is arranging for a consolidation of its local works with the main plant at Riverside, N. J., and considerable machinery from the Newark factory will be removed to the last noted works, which will be extended for the expansion. It is purposed to close the Newark plant.

The Osborne Co., 759 Summer Avenue, Newark, manufacturer of paper products, will build a three-story and basement addition, 62 x 108 ft., to cost about $100,000 with equipment. William A. Bishop and Henry D. Scudder, Jr., 9 Clinton Street, are engineers and architects.

New England

BOSTON, Aug. 13.

ALTHOUGH the local machine tool trade suspended business from Thursday evening, Aug. 9, to Monday morning, Aug. 13, more machine tools were sold in this market the past week than in any similar period since June. The Norton Co., Worcester, is reported to have bought three radial drills, and four local manufacturers as many used presses. A Jackson, Mich., shop purchased the following used equipment: one 14 ft. x 6-in. lathe, one 20-in. drill, one large power hack saw, one 16-in. Kelley shaper and a Blount wet tool grinder. One Greater Boston manufacturer has revived inquiries on a large and high-priced mill, a 9-ft. radial drill and three or four large boiler shop tools.

Stone & Webster have purchased a 20-ton Niles crane for the new Edison plant at Weymouth and are inquiring for four power house cranes for a Ford plant.

Small tools are selling freely. The Brown & Sharpe Mfg. Co., Providence, has issued a new price list on high-speed and carbon cutters, which shows numerous advances as well as a larger discount. Quantity differential discounts on hack saw blades have been adopted in this market. Less than half gross lots are now 33⅓ per cent discount, one to five gross lots 40 per cent. and five gross and larger lots 40 and 10 per cent.

Gravity conveyor equipment is required for the manufacturing plant and warehouse addition contemplated by the Merchants Terminal Co., Charlestown, Boston. Monks & Johnson, 99 Chauncy Street, are the engineers.

Plans will soon be completed for an elementary school containing shops and manual training quarters to be erected by the city of Boston at Roxbury, to cost $450,000. Bids for equipment will not be asked for several weeks.

A bottling plant containing 80,000 sq. ft. of space and costing more than $250,000 to be erected by the Curran & Joyce Co., Lawrence, Mass., on a site formerly owned by the Mills Machine Co., Beacon Street, that city.

The Edward J. Lamothe Co., 31 Albany Street, Cambridge, Mass., is in the market for a used Horning press, Bliss No. 16, Niagara 13 or 14, V & O No. 42, or Leffler No. 2 or 3.

Manual training equipment will be installed in the new three-story high school to be erected at Beverly, Mass., estimated to cost $750,000, for which foundations are being laid. Adden & Parker, 177 State Street, Boston, are architects. Metal-working and woodworking equipment will not be purchased for about 18 months.

Hamilton & Hamilton, Jr., Inc., manufacturing jeweler, 166 Eddy Street, Providence, R. I., have let contract to the C. I. Bigney Construction Co., 184 Washington Street, for a one-story brick and mill factory, 50 x 200 ft., on Allens Avenue.

Foundations have been commenced for a new one-story and basement addition, 75 x 100 ft., at the plant of the Gillette Safety Razor Co., South Boston, to cost about $200,000. Charles T. Main, 49 Federal Street, Boston, is engineer.

The Connecticut Co., 22 Church Street, New Haven, Conn., operating a motor bus line, has plans for a one-story machine and repair shop, 68 x 208 ft., at Grand Avenue and Haven Street, to cost about $60,000. Charles R. Harte and H. R. Stamm are company engineers.

The Connecticut Light & Power Co., Norwalk, Conn., will commence the erection of a one-story power house to cost $50,000.

The Boston Consolidated Gas Co., 149 Tremont Street, Boston, will build a new one-story steam power house at 234 Victory Road.

Continuing its expansion program, the Hunt-Spiller Co., 381 Dorchester Avenue, Boston, manufacturer of gun castings, etc., has filed plans for a new one-story foundry to cost about $150,000, including equipment.

The Thinsheets Metals Co., Railroad Hill Street, Waterbury, Conn., has awarded contract to the Tracy Brothers Co. for a one-story addition, 25 x 62 ft., to replace a portion of its works recently destroyed by fire.

The Central Connecticut Power & Light Co., Essex, Conn., is concluding arrangements for the purchase of the local plant and system of the Essex Light & Power Co., recently sold to Bodell & Co., Providence, R. I., investment brokers. The new owner purposes to make extensions to cost about $500,000, including work at the power dam on the Salmon River.

Manual training equipment will be installed in the three-story high school to be erected at Needham, Mass., estimated to cost $280,000, for which foundations will be laid at once. The Thomas M. James Co., 3 Park Street, Boston, is architect.

The Textile Finishing Machinery Co., 171 Westminster Street, Providence, is having plans drawn for a new one-story forge shop, in connection with other structures. Lockwood, Greene & Co., 24 Federal Street, Boston, are architects and engineers.

The Westinghouse Lamp Co., 165 Broadway, New York, will raze four factory buildings at Hamlin and William Streets, Middletown, Conn., to make way for a new plant unit.

The Board of Light Commissioners, Wakefield, Mass., has plans for the erection of a new municipal power house. Lockwood, Greene & Co., 24 Federal Street, Boston, are engineers.

A three-story ice manufacturing and refrigerating plant, with portion of one floor to be equipped as a baking plant, will be erected at the Walker School, Simsbury, Conn.

The Oakville Co., Waterbury, Conn., manufacturer of metal clips, pins, etc., has awarded contract to the John W. Ferguson Co., Paterson, N. J., for a five-story addition.

Baltimore

BALTIMORE, Aug. 13.

PLANS are under consideration by the Kelly-Springfield Tire Co., Cumberland, Md., for the erection of new works in Canada, for which a site is being selected.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until Sept. 4 for a quantity of electric wire and cables for Eastern and Western yards, schedules 1207, 1208.

Beckerley & Trusler, 614 East Lombard Street, Baltimore, have inquiries out for a bolt-cutting and threading machine, large capacity, Landis type, second-hand.

The Baltimore & Ohio Railroad Co., Baltimore, plans the purchase of a number of machine tools, including shapers, engine lathes, drill press, centering machine and small tools.

The Asheville Light & Power Co., Asheville, N. C., is concluding negotiations for the purchase of the power plants and property of the North Carolina Power Co., including a steam-operated plant at Owenby, and hydroelectric generating stations at Craggy, Marshall and Big Ivy. Plans are being considered for extensions and the installation of additional equipment.

The Reliance Pump & Machine Co., Baltimore, recently organized, has acquired a three-story building at 120 South Calvert Street for the manufacture of automobile pumps and other pumping machinery. C. B. Dallam is president and H. C. Dougall, secretary and treasurer.

R. P. Johnson, Wytheville, Va., machinery dealer, has inquiries out for a narrow gage locomotive, gasoline operated, for industrial service; also, for one belt-driven air compressor, 8 x 8 in., second hand.

Manual training equipment will be installed in the high school to be erected at Hyattsville, Md., estimated to cost $90,000. The Board of Education, Upper Marlboro, Md., is in charge.

L. G. Neal, Atlanta, Ga., is organizing a company to build an ice-manufacturing plant. A mechanical laundry plant is also being considered. About $200,000 will be expended for building and machinery.

In connection with its proposed new foundry and plant at Norfolk, Va., estimated to cost $200,000, the Shamrock Propellers Co. will continue the operation of its works at Seattle, Wash., where executive headquarters are located. C. H. Boyles is general manager.

The National Show Case Co., Columbus, Ga., is in the market for an 80-hp. boiler and auxiliary equipment.

William W. Jones, 510 Tucker Building, Raleigh, N. C., has inquiries out for an electrically operated baling press.

The Speakman Co., 816 Tatnall Street, Wilmington, Del., manufacturer of steam supplies, plumbing equipment, etc., has awarded contract to John E. Healy & Son, 707 Tatnall Street, for the erection of three-story addition to its plant 60 x 75 ft., to cost $51,500.

J. E. Cousins, Jr., Prince George, Va., has inquiries out for a gas engine, well-drilling tools and machinery.

The Southeastern Portland Cement Co., recently organized, has established temporary offices at the Hotel Dempsey, Macon, Ga., to carry out construction plans and make purchases for its new plant at Ainslie, on which work will commence at an early date. It will have a capacity of 3000 bbl. per day, and is estimated to cost $2,000,000. The company will also install quarrying machinery, crushing and pulverizing equipment, etc., on a local limestone deposit. G. P. Dieckman is vice-president and general manager.

The Kendall Motor Products Co., recently organized to take over the business and patents of the Kendall Engineering Corporation, Washington, is perfecting plans for the establishment of a plant to manufacture piston rings and kindred automotive equipment. Robert L. Kendall is head.

The Harvey Co., 113 South Street, Baltimore, is in the market for steel tanks of 1000, 4500 and 10,000 gal. capacity.

William A. Morgart, Cumberland, Md., and associates, have acquired about 8000 acres of coal lands in Garrett County and plan the installation of mechanical and electrical equipment for development and operation, to cost about $75,000.

The Polan Katz Co., 621 East Baltimore Street, Baltimore, is desirous of getting in touch with manufacturers of sectional steel and other standardized buildings for industrial service.

The A. J. Baker Packing Co., Inc., Asheville, N. C., recently organized with a capital of $500,000, has plans for the installation of an ice and cold storage house in connection with a new meat-packing plant on the French Broad River, estimated to cost $250,000. The company will install conveying machinery, spiral chutes and other equipment in the main packing works. John A. Baker is president, H. C. Bruner secretary, both of Asheville.

The Leonhardt Wagon Mfg. Co., 417 East Saratoga Street, Baltimore, contemplates the erection of a plant at Eighth and Orleans Streets at a cost of about $90,000, to be ready for operation the first of the year. E. M. Leonhardt is president.

Beckerley & Trusler, 614 East Lombard Street, dealers in marine supplies, are inquiring for a large bolt-cutting and threading machine.

The Hackley-Morrison Co., Inc., 1708 Lewis Street, Richmond, Va., machinery dealer, has inquiries out for a triplex plunger pump, belt-driven, new or second-hand.

The Common Council, Pageland, S. C., is planning for the installation of a municipal electric lighting plant. The Ryan Engineering Co., Columbia, S. C., is engineer.

The Common Council, Walnut Grove, S. C., is perfecting plans for a new municipal hydroelectric power plant, estimated to cost $85,000.

The Logan-Robinson Fertilizer Co., 26 Broad Street, Charleston, S. C., recently formed with a capital of $100,000, is planning for the installation of mixing machinery, conveying equipment, power machinery and other apparatus in a local building. W. Hampton Logan is treasurer.

Philadelphia

PHILADELPHIA, Aug. 13.

BIDS are being taken until Aug. 22 by the Koelle-Greenwood Motor Co., 6025 Germantown Avenue, Philadelphia, for a two-story and basement service and repair building, 70 x 210 ft., on Chelten Avenue, to cost $100,000. P. S. Tyre, 1509 Arch Street, is architect.

The American Brush Manufacturers' Association, 505 Arch Street, Philadelphia, is in the market for nailing and trimming machines and other kinds of brush-manufacturing machinery.

A one-story power house will be erected at the textile mill of the Krout & Fite Mfg. Co., Allegheny and Emerald Streets, Philadelphia, for which plans have been drawn by W. E. S. Dyer, Land Title Building, engineer.

The Philadelphia Commercial Museum, Thirty-fourth Street, has received an inquiry from a company at Zagreb, Jugoslavia, for American machine tools, saws, tools for machinists and tinsmiths, pipe and fittings; from Caracas, Venezuela, for rotary drying equipment; from Ludhiana, India, for 10-in. and 12-in. files, second quality, half-round and flat iron and steel files; from Havana, Cuba, for match-manufacturing machinery and machines for tipping shoe laces with metal ends.

The Atlantic Refining Co., 3144 Passyunk Avenue, Philadelphia, will commence the erection of a new building at its oil refinery to cost about $40,000.

Bids will be received by the Board of Education, Sixth Avenue and Fifteenth Street, Altoona, Pa., until Aug. 20, for an addition to its central power plant, with installation to include one watertube boiler, with stoker, fuel economizer and kindred equipment, and two turbo-generators, with switchboard and auxiliary apparatus. The Stewart A. Jellet Co., 1200 Locust Street, Philadelphia, is engineer. W. F. Eberle is president of the board.

The Chrome Products Co., Inc., Fuller Building, Philadelphia, operating with a capital of $100,000, has acquired the John Dunn property at Rock Springs, near Elkton, Md., and plans for the installation of quarrying machinery.

Charles W. Rigg, Pottsville, Pa., and associates have organized three new light and power companies, to install plants and systems in Tunkhannock Township and vicinity. The companies will be known as the Tunkhannock Township-Wyoming Electric Co., Lemon Township-Wyoming Electric Co., and the Falls Township-Wyoming Electric Co.

Fire, Aug. 6, destroyed a portion of the plant of the Myerstown Foundry & Mfg. Co., Myerstown, Pa., manufacturer of iron and steel castings, etc., with loss estimated at $50,000 with equipment. It is planned to rebuild.

The Harrisburg Light & Power Co., Harrisburg, Pa., will make enlargements in its generating plant on Cedar Street, with installation to include two turbo-generators, each 13,500 hp. capacity, seven watertube boilers, coal and ash-handling machinery and auxiliary equipment.

Due to conditions in the shipbuilding market, the Merchant Shipbuilding Corporation, Chester, Pa., is in process of liquidation and will cease active operations at its plant on Sept. 1.

The People's Fuel & Supply Co., York, Pa., operating coal-mining properties in Bedford County, is planning for the installation of electric power, hoisting and other equipment. Arrangements are being made for an increase in capital from $100,000 to $350,000, a portion of the proceeds to be used for equipment purchases.

The A. B. Rote Architectural Iron Works, 315 North Cherry Street, Lancaster, Pa., has acquired the plant and adjoining site formerly occupied by the Penn Iron Co., Ltd., North Plum Street, totaling about 7 acres. The new owner will remove its plant to the site following improvements in existing buildings, and will install additional machinery.

The Delaware & Hudson Coal Co., Scranton, Pa., is planning the construction of a new coal breaker at Olyphant, Pa., with capacity for handling the output of all local mines, with those at Blakeley, Dickson City and Throop.

Robert A. Feroe, Charlotte and Water Streets, Pottstown, Pa., manufacturer of paper boxes and containers, has commenced the erection of an addition to his plant, and will install considerable machinery, with motors, transmission equipment, etc.

The McConnellsburg Electric Light, Heat & Power Co., McConnellsburg, Pa., recently organized, is arranging for the installation of a plant and system for local service. G. W. Hays is treasurer. The same interests have also formed two other companies to operate in this district, to be known as the Todd Electric Light, Heat & Power Co., and Ayr Electric Light, Heat & Power Co. H. S. Daniels has been elected treasurer of the first noted, and D. H. Patterson, treasurer of the Ayr company, both of McConnellsburg.

The United Gas & Electric Corporation, Lancaster, Pa., a Connecticut corporation, has perfected plans for a merger with the Berkshire Corporation, operating light and power properties in adjoining territory in New York State, which in the future will be conducted under the United name. The consolidated company will have a capital of $57,500,000, and plans extensions in generating stations and system.

Pittsburgh

PITTSBURGH, Aug. 13.

MACHINE tool business in this district still is dull. The Westinghouse Electric & Mfg. Co. is a steady buyer, but this company follows the practice of issuing lists every three months and then closing against them to the extent of the quarterly appropriations. The trade is looking for orders before long from the Baltimore & Ohio Railroad, which a few weeks ago issued a list for its Glenwood shops, and also from the Pennsylvania Railroad, which has not yet begun to buy against the list of 34 tools for shops in its Central Region, issued a few weeks ago.

The Pittsburgh Board of Public Education about Oct. 1 will issue a list of tools for the South Hills vocational high school and in the meantime Samuel Diescher & Sons, engineers, Farmers Bank Building, Pittsburgh, will probably issue the formal inquiries for the tools for a large machine shop for the new Baltimore plant of the Standard Sanitary Mfg. Co.

Occasional inquiries are coming out for cranes, but sales are few and builders of rolling mills and rolling mill equipment, as well as of power equipment still find new business light. The Ohio Edison Co., which is to build a large power plant at Toronto, Ohio, will buy two 30,000-kw. turbines. This contract is being handled in New York.

The E. E. White Coal Co., Stotesbury, W. Va., is planning to rebuild its machine and repair shops recently destroyed by fire with loss of about $100,000, including equipment.

The McKenna Brass & Mfg. Co., First and Ross Streets, Pittsburgh, is perfecting plans for a branch plant at 483 Whitehall Street, Atlanta, Ga.

A machine shop and parts department will be installed in the one-story service building, 36 x 170 ft., to be erected by the Boylston-Chevrolet Motors, Inc., Bradford, Pa., representative for the Crevrolet automobile, on Boylston Street. C. H. Hope heads the company.

The Common Council, Parkersburg, W. Va., is considering the installation of electrically-operated pumping machinery in connection with extensions and improvements in the municipal water system. John M. Rice, Oliver Building, Pittsburgh, is engineer.

The Eureka Rubber Preserving Co., Huntington, W. Va., has tentative plans for the erection of a new local plant for the manufacture of rubber specialties. L. C. Basham, P. O. Box 511, Huntington, is general manager.

The Central Automobile Corporation, Fairmont, W. Va., will install a machine shop in its proposed two-story service building, 100 x 120 ft., estimated to cost $55,000.

H. L. Kreusler, 3301 Penn Avenue, Pittsburgh, is perfecting plans for the establishment of a new plant for the manufacture of concrete and cement blocks, and kindred construction products.

The Cheat River Railroad Co., Erwin, W. Va., recently organized to construct and operate a railroad from Erwin to St. George, W. Va., has tentative plans for a locomotive repair shop at the terminus. W. H. Mason and W. G. Wilson, both of Elkins, W. Va., head the company.

Manual training equipment will be installed in the new high school to be erected at Raymond City, W. Va., by the Poca District School Board, Poca, W. Va., for which plans will soon be drawn.

A lathe, bench tools and other equipment will be installed in the machine department in the new service building to be erected by the Kirk Motor Co., Bluefield, W. Va. E. S. Kirkpatrick is manager.

The Bessemer Gas Engine Co., Grove City, Pa., has construction under way on an addition, to be known as Building No. 26, comprising the last of a series of structures carried out under an expansion program involving $500,000.

The Virginia-Western Power Co., Ronceverte, W. Va., has acquired the properties of the Charlottesville & Albemarle Railway Co., Greenbrier Power Co., Staunton Lighting Co.,

and the Riverside Light & Power Co. Plans are under way for extensions, including the installation of additional equipment and transmission lines.

A machine shop will be installed in the two-story automobile service building, 66 x 200 ft., to be erected by C. J. Allen, City Deposit Bank Building, 6112 Penn Avenue, estimated to cost $100,000.

The American Sheet Glass Co., Huntington, W. Va., recently organized, has arranged for an increase in capital from $250,000 to $350,000. It will establish a local plant, with installation to include eight processing machines, power equipment and auxiliary machinery. H. E. Travis and Paul M. Robinson head the company.

Manual training equipment will be installed in the high school to be erected at Plymouth, W. Va., estimated to cost $100,000, for which the Board of Education will soon have plans prepared.

The Common Council, Franklin, W. Va., is perfecting plans for a municipal hydro-electric power plant on the Potomac River, with transmission system.

Chicago

CHICAGO, Aug. 13.

THE Elgin, Joliet & Eastern has distributed orders for a large part of its list of long standing, with the likelihood that purchases, when completed, will involve a total exceeding $100,000. Word comes from Detroit that the Pere Marquette is taking similar action on its extensive inquiry for its Grand Rapids, Mich., shops. The Illinois Central has closed for a 32-in. shaper, a 500-lb. power hammer, a 20-in. and a 36-in. drill press. Demand from industrial sources is still light. The Nash Motor Co. has purchased a few cylinder boring machines for its Milwaukee plant.

The Illinois Steel Co. is inquiring for a motor-driven 32-in. heavy duty engine lathe and a motor-driven 48-in. radial drill for its Gary works, and the Universal Portland Cement Co. is in the market for a 16-in. and an 18-in. engine lathe, both of which are to be motor-driven and geared head. These are for its Buffington, Ind., works. The State of Michigan, which has been inquiring for 15 engine lathes for the University of Michigan at Ann Arbor, is understod to have purchased at least a part of them. There is considerable interest in punch presses, one local user being in the market for nine medium-sized machines, while another manufacturer, who recently took an order for 400,000 locks for steel lockers, is inquiring for four presses of different sizes.

The Ford Motor Co., Detroit, Mich., has ordered two No. 8 cupolas from the Whiting Corporation, Harvey, Ill. The same builder has taken an order from the Charles Parker Co., Meriden, Conn., for a No. 2 cupola.

The Mi-Filer Mfg. Co., 1604 North Church Street, Decatur, Ill., recently incorporated with $25,000 capital stock, will manufacture kites and other novelties. The company has leased 5000 sq. ft. of factory space and its equipment will include a wire bending machine and a special machine to cut wire in lengths and loop it at the ends. Officers are Harvey A. Sellers, president; John Hohn, vice-president; B. T. Sellers, secretary, and B. K. Hohn, treasurer.

A. Epstein, 2001 West Roosevelt Road, Chicago, has prepared plans for a four-story reinforced concrete factory and warehouse, and a one-story power plant at the southeast corner of California Avenue and Thirty-first Street for the Federal Paper Co., represented by Oscar and Harry Gumbinsky of Gumbinsky Brothers Co., paper mill supplies, 2261 South Union Avenue, who organized the new company. The cost of the building is estimated at $4,000,000 and the machinery and equipment at $1,500,000.

The Crown Rheostat & Supply Co., 35 South Desplaines Street, Chicago, is having plans prepared for a two-story building, 50 x 72 ft., 1908-1914 Park Avenue, to cost $28,000.

The Interstate Public Service Co., subsidiary of the Middle West Utilities Co., Chicago, will erect an electric power plant to cost several million dollars on the Ohio River near Jeffersonville, Ind.

The Lindell Drop Forge Co. is laying a sidetrack from the New York Central Railway to the site of its new plant on which construction is being commenced.

The Michigan Agricultural College, Lansing, Mich., will construct a power plant to cost $150,000.

The American Sash Weight Foundry Co., located in a building erected by the Sears Tire Equipment Co. at Davenport, Iowa, will commence operations within a few weeks. The company was organized last spring with $200,000 capital stock. The principal product will be a sash weight patented by B. F. Aufderheide, Sr. Officers are president and treasurer, B. F. Aufderheide, Sr.; vice-president, Charles Robeson; secretary, Ray Nyemaster.

The Western Electric Co., Hawthorne, Ill., has acquired a 25-acre site at East Nashville, Tenn., where it plans to build a factory for the manufacture of electrical equipment. Details are not yet available.

The Chicago Motor Coach Co., which operates a bus system over the Chicago boulevards, plans the construction of a garage and repair shop to cost $350,000 on a site, 270 x 275 ft., adjoining the Chicago & Western Indiana Railroad.

The Yellow Cab Co., Chicago, plans the erection of a garage and service station on a site containing 60,000 sq. ft. on Halsted Street, which it recently purchased.

The Pullman Co., Chicago, has purchased from the Railway Steel Spring Co. a two-story building on the east side of Cottage Grove Avenue, north of 111th Street. The building is an L-shaped structure, 276 x 397, and 350 x 404 ft.

The Department of Public Works and Buildings, Springfield, Ill., has tentative plans for a new State-owned cement manufacturing plant estimated to cost $3,000,000, with machinery and power house. Edgar A. Martin, 304 South Wabash Avenue, Chicago, is architect. C. A. Miller is director of the department.

The Illinois Power & Light Corporation, Peoria, Ill., is disposing of a preferred stock issue of $2,059,000, the proceeds to be used for extensions, including the erection of an addition to the generating plant at Venice, Ill., to cost about $1,000,000; an addition to the power plant at Peoria and the installation of new equipment; extensions in transmission lines and the installation of additional power equipment for the electric railroad system at Springfield, Ill.

Manual training equipment will be installed in the new three-story junior high school to be erected at Winona, Minn., estimated to cost $210,000, for which bids will be called on a general contract in the fall. Croft & Boerner, Inc., 1006 Marquette Avenue, Minneapolis, Minn., are architects.

J. E. Decker & Sons, Mason City, Iowa, are planning the erection of a one-story machine shop, 75 x 100 ft., to cost about $45,000, including equipment.

Manual training equipment will be installed in the new high school to be erected at Edwardsville, Ill., estimated to cost $300,000. M. Kane, Bohm Building, is architect.

The Illinois Light & Power Co., Illinois Merchants' Bank Building, Chicago, has tentative plans for a new electric power plant on Lake Decatur, Decatur, Ill., estimated to cost $3,000,000, including transmission lines.

Manual training equipment will be installed in the new high school to be erected at Pawnee, Ill., to cost about $100,000, to replace a structure recently destroyed by fire. The Board of Education, A. S. Lupton, president, is in charge.

Buffalo

BUFFALO, Aug. 13.

PLANS are being prepared by the Crouse-Hinds Co., Syracuse, N. Y., manufacturer of electric wiring equipment, for a new one and two-story building at its Toronto works, Labatt Avenue, estimated to cost $150,000. Sproatt & Rolph, 1162 Bay Street, Toronto, are architects.

The Carhart Brothers Foundry Co., 1618 North Salina Street, Syracuse, N. Y., will soon take bids for extensions in its plant to cost approximately $25,000.

The Forness Oil Co., Inc., Bolivar, N. Y., is planning for the installation of additional equipment. E. W. Cady is head.

The Buffalo Housewrecking & Salvage Co., Sycamore Street and the Erie Railroad, Buffalo, has submitted a high bid to the War Department, Washington, for the plant of the Curtiss Aeroplane Co., Elmwood Avenue, and expects to take over the property at an early date.

Electric power equipment, conveying and other machinery will be installed in the three-story addition, 50 x 120 ft., to be erected at the plant of the G. & H. Cone Co., 619 East Catherine Street, Binghamton, N. Y., estimated to cost about $150,000.

The W. A. Case & Son Mfg. Co., Kensington Avenue, Buffalo, manufacturer of steam heating and plumbing equipment, has acquired the plant and business of the Walker Mfg. Supply Co., 203 Woodbridge Street, Detroit, specializing in a similar line. The Case company has been operating a branch at 2337 Beecher Street, Detroit, for some time, and the Walker business will be consolidated with this establishment.

The Rome Wire Co., Clyde Avenue, Buffalo, manufacturer of electrical wires and cables, etc., has purchased a block of property in the vicinity of its works, totaling over 4 acres, and will use it for expansion. Plans for the initial building have been arranged.

The New Fane Cold Storage Co., New Fane, Niagara County, N. Y., recently organized with a capital of $150,000, is arranging for a new ice-manufacturing and cold storage plant. The company is headed by B. S. Harwood and B. S. Pettit, both of New Fane.

J. E. Wells, Main Street, Salamanca, N. Y., is planning for the installation of a machine shop in a new automobile service works to replace a plant recently destroyed by fire.

Traveling ovens, electric power equipment, conveying machinery and other mechanical equipment will be installed in the new baking plant of the National Biscuit Co., Ellicott Street, Buffalo, on Urban Street, to be seven-stories, 134 x 205 ft., for which ground will be broken at once. An appropriation of $800,000 has been arranged for the building and machinery.

F. A. Carr and E. W. Ferguson, Flint, N. Y., have formed the Flint Cold Storage Co., capitalized at $200,000, to construct and operate a local ice-manufacturing and cold storage plant.

Manual training equipment will be installed in the new union school to be erected at Palmyra, N. Y., estimated to cost $325,000, for which ground will be broken at once. Tooker & Marsh, 101 Park Avenue, New York, are architects.

The Depew & Lancaster Light, Power & Conduit Co., Central Avenue, Lancaster, N. Y., has arranged for the issue of 25,000 shares of stock, the proceeds to be used for extensions in plants and system.

Cincinnati

CINCINNATI, Aug. 13.

AUGUST so far has shown a decided improvement over the same period in July in the machine tool industry. Last week some good orders were booked, largely from the railroads and automotive industry. A number of Western railroads which had been in the market for many months closed for part of their requirements, and more business is expected within the next two weeks. The Norfolk & Western Railroad has also bought a number of tools, and the recent list of the Southern Railway has been purchased.

The Seaboard Air Line is reported to be preparing a list of tools to be issued shortly, and the Virginian Railway is also expected to be a buyer. The Borough of Manhattan is in the market for a number of tools, and the Mobile & Ohio Railroad is also inquiring for miscellaneous machines. Old machinery is still in good demand, but used tools in good condition are very hard to get. Prices are very strong on both new and used machines.

The plant and equipment, including many machine tools, of the Equity Equipment Co., Cincinnati, was completely destroyed by fire Aug. 8, the loss being estimated at $75,000. No definite decision regarding rebuilding has been reached. C. Taylor Handman is president.

The Robert Neuman Co., Cincinnati, manufacturer of paper boxes, has been incorporated with a capitalization of $75,000. It will also manufacture filing cabinets and systems. New equipment will be required. Robert Neuman is president.

The Getgey-Jung Co., Cincinnati, has been incorporated with a capitalization of $25,000 to manufacture clothes pressing machines. The plant will be located at 105 West Central Parkway. No machine tool equipment will be required at once. George H. Jung is president.

The Williamson Heater Co., Cincinnati, manufacturer of furnaces and sheet metal clothes dryers, has completed the erection of its new sheet metal-working shop and an assembling plant for furnaces. Sheet metal-working machinery has been installed, and additional equipment will be added from time to time. The company is working to capacity.

The Kaufmann Metal Parts Co., Bellefontaine, Ohio, manufacturer of piston and gear rings, has purchased, at auction, the plant of the Modern Glass Co., Toledo, for a branch factory to take care of increasing business. The Toledo plant will employ about 300 men. J. S. Kaufmann is president.

The plant of the Lomar Shock Absorber Co., Trenton, hio, has been moved to Middletown, Ohio, to the building formerly occupied by the Willard-Middletown Machine Co.

The Lake Erie & Western Railroad Co. will make additions to its shops at Lima, Ohio, and install additional equipment at a cost of about $150,000.

Detroit

DETROIT, Aug. 13.

WORK will commence on a new electric generating plant at Iron River, Mich., of Diesel engine type, estimated to cost $250,000 with machinery, by the Peninsular Power Co., North Carroll Street, Madison, Wis. Other power plants are also contemplated in this section.

The Ford Motor Co., Highland Park, Mich., is planniig the erection of a new assembling plant at Salt Lake City, Utah, to cost about $200,000 with machinery.

The Ranney Refrigerator Co., Greenville, Mich., has awarded a general contract to the Owen-Ames-Kimball Co., Grand Rapids, Mich., for an addition to cost about $50,000.

The Auto Body Co., Lansing, Mich., has contracted with the Durant Motor Co., to furnish all bodies for the local works during the coming year, and will arrange increased facilities at its plant to handle the output.

The Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich., manufacturer of paper products, has construction in progress on an addition to cost approximately $2,000,000 with machinery.

The Bennett Brass Co., Greenville, Mich., recently formed under State laws, has acquired the plant of the Regle Brass Co. for the manufacture of a general line of brass goods. Plans are under consideration for extensions. W. J. Bennet heads the new company; J. J. Siefen is general manager.

Wylie & Wilson, Inc., Saginaw, Mich., recently organized, has acquired the plant of the Brooks Mfg. Co., manufacturer of knock-down boats, etc., and plans extensions for larger output.

The Sand Lime Brick Co., 1008 Vinton Building, Detroit, will take bids early in September for a new plant at River Rouge, Mich., to cost about $75,000, including machinery and electric power equipment.

The Wolverine Motor Truck & Coach Co., Detroit, recently organized with a capital of $1,000,000, has acquired property at French Road and Gratiot Avenue for a new plant for the production of motor buses, to include the manufacture of motors, bodies, frames and parts. J. Milton Earle is president, and W. K. Ackerman, secretary and treasurer.

The Goodrich Mfg. Co., Charlotte, Mich., has acquired a building formerly occupied by the Charlotte Mfg. Co., and will operate it for the manufacture of foot dimmers and other automotive lighting specialties.

The Manitowoc Portland Cement Co., operated by the Newaygo Portland Cement Co., Newaygo, Mich., will take bids early in September for its new plant, to consist of a main one-story unit, 75 x 500 ft., with power plant and other buildings, estimated to cost $1,200,000. The MacDonald Engineering Co., 53 West Jackson Boulevard, Chicago, is engineer. Clay Hollister, 521 Fulton Street, Grand Rapids, Mich., is president.

Indiana

INDIANAPOLIS, Aug. 13.

BIDS will soon be asked by the Muncie Malleable Foundry Co., Highland Avenue, Muncie, Ind., for a one-story addition, 70 x 100 ft., estimated to cost $25,000.

The Interstate Public Service Co., Indianapolis, has acquired a tract of 105 acres of land at Jeffersonville, Ind., on the Ohio River, as a site for a new electric generating plant to cost $2,000,000 with machinery and transmission system. Harry Reid is president.

The International Rubber Co., Anderson, Ind., has plans for the rebuilding of the portion of its plant destroyed by fire Aug. 2, with loss estimated at $20,000. A new air compressor and other machinery will be installed. W. H. Lantz is one of the heads of the company.

The Fibre Conduit Co., Orangeburg, N. Y., manufacturer of insulating conduits, etc., has awarded a general contract to the John Mueller Co., Palladium Building, Richmond, Ind., for the first unit of its new plant at Richmond, to cost $400,000 with machinery. A power house will be built. S. R. Bradley is president.

The Apperson Brothers Co., Kokomo, Ind., manufacturer of automobiles, is planning for expansion to increase the output about 25 per cent. N. H. Van Sicklen is first vice-president and general manager.

The Van Camp Packing Co., Indianapolis, will break ground for a three-story oil refinery, 87 x 120 ft., on Shelby Street, Louisville, to cost $175,000. F. Erhart, Norton Building, Louisville, is architect.

Manual training equipment will be installed in the new high school to be erected at Milton, Ind., for which ground will be broken at once, estimated to cost $90,000. Charles Working & Son, Palladium Building, Richmond, Ind., are architects.

Additional electric power equipment will be installed by the Gary Street Railways Co., Gary, Ind., in connection with extensions in its system to cost about $1,000,000. Charles P. Chase is president.

Ovens, power equipment, conveying machinery, etc., will be installed in the two-story and basement addition to be built by the Calumet Baking Co., Hammond, Ind., for which plans are being drawn by the McCormick Co., 121 South Negley Street, Pittsburgh, architect and engineer.

The Forse Machine Co., Fourteenth Street and Fairview Avenue, Anderson, Ind., has tentative plans for a new one-story foundry. It is expected to start work late in the year. W. H. Forse is president.

The Stutz Motor Car Co. of America, Inc., Tenth Street, Indianapolis, is perfecting arrangements for the manufacture of six-cylinder automobile engines at its plant, with the continuation of the present output of four-cylinder motors. The former Stutz plant on the other side of Tenth Street has been taken over for increased floor area. William N. Thompson is president.

The Central South

ST. LOUIS, Aug. 13.

WORK will soon commence on a new plant at Kansas City, Mo., for the Walker Mfg. Co., Skidmore, Mo., recently organized for the manufacture of oil burners and oil-burning equipment. R. A. Walker is president and general manager.

The American Brake Shoe & Foundry Co., 30 Church Street, New York, has acquired a 4-acre tract at North Kansas City, Mo., and plans for the erection of a new works to cost $350,000, including machinery.

The Kansas Portland Cement Co., Federal Reserve Bank Building, Kansas City, Mo., will commence the erection of a new plant at Bonner Springs, Kan., with power house and machine shop, estimated to cost $1,000,000, including equipment.

The Kentucky Utilities Co., Louisville, a subsidiary of the Midwest Public Utilities Co., 72 West Adams Street, Chicago, has arranged an appropriation of $5,000,000 for extensions in its generating plants and system. The work will include the erection of a new steam-operated electric plant on the Cumberland River, near Pineville, Ky.; a new hydroelectric power plant on the Dix River; steel tower transmission lines to Lexington, Ky., Jeffersonville, Ohio, and other points; additional machinery at present stations, and other equipment.

The Rainbow Coal Co., Louisville, recently organized with a capital of $250,000, is planning the installation of electric power and other equipment at its new coal properties in the Kentucky fields. C. D. Saylers, Louisville, heads the company.

The Commercial Electric Supply Co., Broadway and Spruce Street, St. Louis, is in the market for an electric generator, 75 to 100 kw. capacity, direct-connected to simple slide valve or 4-valve steam engine, and auxiliary equipment.

The Hilton Collins Co., Inc., Louisville, has inquiries out for forge shop equipment, including a 100-lb. hammer, Bradley or similar type, punch, bulldozers and miscellaneous machinery.

The North American Co., 60 Broadway, New York, operating electric light and power properties in Missouri and other Mid-Western points, has preliminary plans for a hydroelectric generating station on the White River, Mo., utilizing a site of the Dixie Power Co., recently secured by Hugh L. Cooper & Co., 101 Park Avenue, New York, engineers, and who will be in charge of construction. The plant will develop an output of about 150,000 kw. and is estimated to cost $20,000,000. A steel tower transmission line will be built to St. Louis and other points.

An ice-manufacturing and refrigerating plant will be built in connection with the new two-story meat-packing plant, 60 x 135 ft., to be erected at Paducah, Ky., by the Magle Packing Co., affiliated with the E. Bucher Packing Co., Cairo, Ill., estimated to cost $100,000. M. P. Burt, Falls Building, Memphis, Tenn., is architect.

The Board of Works, Fort Smith, Ark., is planning the installation of electrically-operated pumping machinery in connection with proposed extensions and improvements in the municipal waterworks, estimated to cost $500,000.

The National Machinery Co., 116 Miners' Bank Building, Joplin, Mo., recently incorporated with a capital of $200,000, has leased a building for the manufacture of deep-well pumping machinery and parts. The installation is estimated to cost $35,000. P. E. Taber is president, and V. V. Kirkpatrick, secretary and treasurer.

Manual training equipment will be installed in the two-story high school to be erected at Lenora, Kan., estimated to cost $90,000, for which bids are being taken on a general contract. Smith & English, Nelson Building, Hutchinson, Kan., are architects.

The Duncan Machinery Co., P. O. Box 265, Knoxville, Tenn., machinery dealer, has inquiries out for small vertical engines, 5 and 6-hp., second-hand.

The Tennessee Electric Power Co., Nashville, Tenn., is planning the erection of three hydroelectric power stations, two to be located on the Clinch River, and the other on the Powell River. The plants will cost more than $5,000,000 with transmission system.

The G. Nash Co., 2537 Broadway, Great Bend, Kan., operating a machine shop, is planning the installation of a lathe, drill press, emery stand and other equipment.

The City Ice Co., Enid, Okla., is planning the construction of a new ice-manufacturing plant estimated to cost $75,000.

C. C. Whitecraft, Hoisington, Kan., operating a machine and forge shop, is planning for the installation of a pipe-threading machine, power hammer, lathe and other equipment.

Manual training equipment will be installed in the new high school to be erected at Great Bend, Kan., estimated to cost $225,000, for which a bond issue is being arranged. The Board of Education will soon select an architect.

The Loeb Laundry Co., Memphis, Tenn., has inquiries out for a 75 to 100-kw. generator, 100 to 125 volts, d. c., with auxiliary equipment

A manual training department will be installed in the junior high school building at Oklahoma City, Okla., in connection with remodeling and extensions for a senior high school. Layton, Smith & Forsythe, 701 Southwest National Bank Building, are architects.

A manual training department will be installed in the new two-story school, 72 x 140 ft., to be erected at Binghamton, Tenn., for negro pupils, to cost about $75,000. Mahan & Broadwell, Memphis, Tenn., are architects.

The Kansas City Machine Works, 1303 West Eighth Street, Kansas City, Mo., is inquiring for an oil-operated engine, 50 to 200 hp., Fairbanks-Morse or similar type.

Manual training equipment will be installed in the new two-story high school to be erected at Chillicothe, Mo., estimated to cost $300,000, for which bids will be asked on a general contract early in September. R. W. Roberts, Chillicothe, is architect.

The Newport Rolling Mill Co., Newport, Ky., is in the market for a 54-in. second-hand roller leveler, with roll 3¾ diameter. Address the Purchasing Department.

Milwaukee

MILWAUKEE, Aug. 13.

MACHINE-TOOL business remains confined to scattering single orders. Inquiry is light but shows signs of improving. Confidence is expressed in all quarters that the passing of August will witness a resumption of inquiry and buying on a moderate scale. Machine shop activity in this district is well occupied but new business is developing slowly. The supply of used tools is plentiful, and includes a large percentage of equipment acceptable instead of new, at prices representing an obvious gain.

The Badger-Packard Machinery Co., Milwaukee, has bid in the equipment of the defunct Turner Mfg. Co., gas engines and tractors, Port Washington, Wis., having an appraised value of $183,705, for $39,000. The assets of Winther Motors, Inc., Kenosha, Wis., are to be sold Aug. 16, and the Mitchell Motors Co., Racine, on Sept. 12, but it is likely that both properties will pass in bulk.

The Milwaukee Tank Works, Fratney and Becker Streets, Milwaukee, has let contract to Otto Randolph, consulting engineer, 53 West Jackson Boulevard, Chicago, for a one-story brick and steel assembling shop, 80 x 115 ft., costing about $45,000 complete. It manufactures wood and steel tanks and pumps, and has recently entered quantity production of equipment for gasoline filling stations, garages and idustrial purposes. E. A. Bienenstock is president.

The Green Bay Sugar Co., Green Bay, Wis., has contracted with the Larrowe Milling Co., 8047 Hamilton Boulevard, Detroit, to design and provide the equipment of a new beet pulp drying and feed manufacturing plant, which will represent an investment of $75,000. The H. J. Selmer Co., local contractor, is at work on the building. Charles H. Hine is general manager.

New Holstein, Wis., at a special election, authorized a bond issue of $130,000 for the construction of a municipal water works plant and sewage system, work on which will start next spring. W. G. Kirchhoffer, consulting engineer, Madison, Wis., has been engaged to prepare plans and supervise the project. Estimates on pumps, motors, pipe, tank, etc., probably will be taken before the end of the year.

The Fox River Paper Co., Appleton, Wis., is buying special pulp mill machinery, electric motors, tanks, etc., for a $65,000 addition to its Water Street plant. It will be 37 x 262 ft., one story. The general contractor is C. R. Meyer & Sons Co., Oshkosh, Wis.

Elling O. Weeks, 957 Forty-fourth Street, Milwaukee, inventor of automotive equipment and auxiliaries for gas engines, has organized the Weeks Stafull Co. of Milwaukee to manufacture a condenser attachment for automobile truck and tractor radiators. John E. Nelson and Walter F. Mayer, attorney, appear with Mr. Weeks as incorporators.

The Board of Education, Weyauwega, Wis., let the general contract to Fred C. Lemke & Co., Clintonville, Wis., for a new high school, with vocational training departments, designed by Auler & Jensen, architects, Oshkosh, Wis., and estimated to cost $150,000.

The Gulf States

BIRMINGHAM, Aug. 13.

A ONE-STORY machine shop will be erected by the Acme Carbon Mfg. Corporation, Monroe, La., recently formed with a capital of $250,000, at its proposed local carbon-black manufacturing plant, to cost about $125,000. Bids will be asked for building and tools early in the fall. L. N. Larche heads the company.

The Trinity Portland Cement Co., Dallas and Fort Worth, Tex., will place orders for machinery for its new plant near Fort Worth, within the next three or four months. The plant will have an output of 2500 bbl. per day and the equipment will cost about $350,000. The entire works will represent an investment of $750,000. L. H. McCourtie is president.

The People's Hydroelectric Co., Birmingham, is planning the erection of a hydroelectric power house at Lock No. 2, on the Coosa River, estimated to cost $2,500,000 with steel tower transmission system. Roswell C. Cobb is president.

The Constantin Refining Co., Tulsa, Okla., has acquired property in the Swastika oilfield, near Megargel, Tex., and plans the erection of a new refinery, estimated to cost $350,000 with machinery.

The North Fort Worth Ice Co., Fort Worth, Tex., is arranging for the erection of a new ice-manufacturing plant in the Arlington Heights section, estimated to cost $65,000. P. A. Heeger is president and E. P. Maddox, vice-president.

The Texas Creosoting Co., Orange, Tex., recently formed with a capital of $450,000, is planning the construction of a power house at its proposed tie and lumber-treating plant, to cost about $250,000. Pumping machinery, tanks, and other equipment will also be installed. R. S. Manley is president and general manager.

The Interstate Refineries Corporation, Kansas City, Mo., has taken over the refinery and property of the Ranger Refining & Pipe Line Co., Ranger, Tex., and Kansas City, recently acquired for about $300,000. Plans are under way for extensions in the Ranger refinery, which has been closed for two years, and the installation of additional equipment estimated to cost $100,000.

The Common Council, Pahokee, Fla., is contemplating the construction of a municipal ice-manufacturing plant. Plans are also being considered for the installation of electrically-operated pumping machinery in connection with a new municipal waterworks. A bond issue of $90,000 is being arranged.

The Morton Plow Co., Williston, Fla., recently organized with a capital of $125,000, is perfecting plans for works to manufacture tractor plows. It is purposed to have iron and steel castings made under contract, and bids will soon be asked on this work. Other agricultural equipment will be manufactured at the plant later. L. C. Hester is president.

The Neches Lumber Co., Beaumont, Tex., will build a new mill and power house to cost about $75,000, of which $40,000 will be used for the machinery. The plant will replace an old one, which will be dismantled.

The Texas Central Power Co., Harlingen, Tex., is concluding negotiations for the purchase of the municipal electric light and power plant. Upon acquisition, extensions will be made and additional equipment installed.

The Goodwin Coal Co., Dora, Ala., recently organized with a capital of $1,000,000, is planning the installation of electric power and other equipment at its properties. Olin Goodwin heads the company.

Manual training equipment will be installed in the new high school to be erected at Jeanerette, La., by the Iberia Parish School Board, Iberia, La., estimated to cost $150,000. An architect will soon be selected.

The Bon Secour Lumber Co., Bon Secour, Ala., recently organized with a capital of $250,000, plans the erection of a power house in connection with a new lumber mill, to cost $150,000. C. W. Stallworth heads the company.

Walter L. Ingram, 502 South Hull Street, Montgomery, Ala., is organizing a company to establish a plant for the manufacture of a patented metal signal device to be attached to automobiles for stop and direction service.

The City Council, Greenville, Tex., plans the installation of electrically-operated pumping machinery in connection with extensions in the municipal waterworks, for which a bond issue of $325,000 is being arranged.

The Lufkin Foundry & Machine Co., Lufkin, Tex., is planning for extensions and the installation of additional equipment. The total floor space will be increased to 90 x 450 ft.

The George F. Wheelock Co., Birmingham, manufacturer of sheet metal products, roofing, etc., has tentative plans for extensions, including the addition of new departments and the installation of equipment.

The Bronson Mfg. Co., Bronson, Fla., is perfecting plans for a new electric light and power house. It will also build an ice-manufacturing and cold storage plant. W. J. Epperson is president.

Manual training equipment will be installed in the new high school to be erected at La Compte, La., estimated to cost $100,000. The Rapids Parish School Board, Alexandria, La., J. W. Bolton, president, is in charge. Favrot & Livaudais, Hibernia Bank Building, New Orleans, are architects.

The Navarro Ice Co., Corsicana, Tex., is having plans drawn for a new ice-manufacturing plant on South Twelfth Street, estimated to cost $110,000, with machinery.

The Ajax Petroleum Co., San Antonio, Tex., is perfecting plans for extensions and improvements in its refinery, comprising the former plant of the San Antonio Refining Co., recently acquired. Additional machinery will be installed to develop an output of 1000 bbl. per day. L. H. Coursen is president.

The Florida Machine Works, Inc., 40 Riverside Avenue, Jacksonville, Fla., has filed plans for the first four buildings for its new plant on a 7-acre tract, recently acquired. The structures will be each one-story, comprising machine shop, foundry, pattern shop, and general warehouse and operating building, respectively, estimated to cost $200,000, with machinery. The foundry will be 80 x 212 ft., to be provided with an electric traveling crane; it will be given over to the production of steel, gray iron, brass and aluminum castings. Contract for electric furnaces has been let to the Pittsburgh Electric Furnace Corporation, Pittsburgh, and awards for other tools and equipment will be made at an early date. F. G. Russell is president; F. G. Russell, Jr., is general manager.

The Common Council, Mercedes, Tex., is arranging for a bond issue of $150,000 for the installation of a municipal light and power plant and waterworks system. J. E. Haynes, mayor, is in charge.

The Magnolia Petroleum Co., Dallas, Tex., has acquired 110 acres near Luling, Tex., and is said to have tentative plans for a new oil refinery to cost $500,000 with machinery.

The Southwestern Rubber Co., 202 West Travis Street, San Antonio, Tex., will have its products, including tubes and tires, manufactured under contract. Bids are being received by W. G. Colton, manager.

The Florida Steel & Wire Co., which as noted in THE IRON AGE of July 12 will engage in the manufacture of nails, wire and fencing at Jacksonville, Fla., has elected the following officers: W. A. Evans, president; J. C. Connally, vice-president; E. I. Carefoot, secretary and treasurer; John G. Palmer, general manager. The capital stock is $225,000, of which $150,000 is preferred and $75,000 common stock. The plant expects to have an initial capacity of 200 or more kegs of nails daily. Officers of the company are in the Professional Building and the Bentley shipyard property has been secured for manufacturing operations.

The Pacific Coast

SAN FRANCISCO, Aug. 14.

GROUND will be broken by the Coast Mfg. Co., Monrovia, Cal., manufacturer of automatic water heaters, etc., for a new plant to cost $25,000. George D. Wilcox is head.

The Standard Underground Cable Co., Westinghouse Building, Pittsburgh, has awarded a general contract to the Dinwiddie Construction Co., Crocker Building, San Francisco, for a new two-story plant, 125 x 300 ft., at Emeryville, Cal.,

to cost $200,000. B. H. Prack, Sixty-second and Green Streets, Emeryville, is engineer.

Manual training equipment will be installed in the new high school to be erected at Sawtelle, Cal., estimated to cost $350,000. Russell & Alpaugh, 1106 Story Building, Los Angeles, are architects.

The Hawley Pulp & Paper Co., Oregon City, Ore., has plans for a three-story addition to replace the present Mill B on Main Street and the installation of additional machinery. A new power plant will also be erected.

The San Joaquin Irrigation District, Manteca, Cal., will erect a new hydro-electric power plant on the Stanislaus River, Calaveras County, to develop a capacity of 7500 hp., estimated to cost $390,000.

The Vitrified Products Corporation, San Diego, Cal., has plans for a new plant unit at Oldtown, for the manufacture of tile and kindred products, to cost about $100,000 with machinery. George W. Kummer is secretary and general manager.

The Palo Verde River Irrigation District, 517 East Adams Street, Phoenix, Ariz., is arranging for a bond issue of $23,000,000, a part of the proceeds to be used for the construction of new hydroelectric power plants and steel tower transmission systems.

The Western Cotton Oil Co., Phoenix, Ariz., has plans for new works at Seventh Street and the line of the Arizona Eastern Railway Co., to cost more than $150,000. A power house will also be built. E. A. McDonald is general manager.

The Mt. Smiley Lumber Co., La Grande, Ore., plans the construction of a power house in connection with a new mill, estimated to cost $100,000. A. H. Strang represents the company.

The California-Oregon Power Co., San Francisco, is planning for a new hydroelectric power plant at Klamath Falls, Ore., estimated to cost $1,500,000 with machinery.

The Union Oil Co., Los Angeles, has plans for a new oil storage and distributing plant at San Luis Obispo, Cal., estimated to cost $250,000. C. E. Arnold is engineer.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until Sept. 4, for one planing mill exhauster fan and one induction motor for the Mare Island Navy Yard, schedule 1200; also for one coil winding machine for the San Diego Navy Yard, schedule 1214; until Aug. 28 for wrenches and files for the San Diego Navy Yard, schedule 1201; and until Sept. 4 for one extractor and press for the Puget Sound Navy Yard, schedule 1213.

The Pacific Gas & Electric Co., 445 Sutter Street, San Francisco, will soon take bids for a new steam-operated electric power plant, 70 x 100 ft., estimated to cost $250,000. The company engineering department is in charge. It has also acquired property on Tenth Street, Richmond, Cal., for an addition to its power house.

The Yosemite Portland Cement Co., Simonson Building, Merced, Cal., recently organized, is arranging to commence construction of its new plant, estimated to cost $800,000 with machinery. A power house will also be built. Leigh Hunt, Kansas City, Mo., is engineer. George E. Nicholson, president of the National Cement Co., Kansas City, heads the new organization; C. S. Woody is vice-president.

The Butte Refining Co., Butte, Mont., has acquired property in the southwest section of the city for the erection of a new oil and gasoline refinery, estimated to cost $450,000 with machinery.

Canada

TORONTO, Aug. 13.

THE machine tool market in this territory continues active. Many new industrial plants and additions to old ones are under construction, and while a large amount of equipment has been purchased on this account, many concerns have not yet entered the market for the necessary requirements. A fairly good demand is also reported from electrical, waterworks, and sewerage plants and inquiries are in the market from several municipal governments for pumps and other equipment.

The Canadian Pacific Railway is expected to enter the market soon for equipment for a new plant under construction in British Columbia. Woodworking equipment is in active demand and Canadian builders and dealers have a number of good orders in prospect. A good demand continues for small tools and supplies.

C. Alfred Maguire, chairman of the Board of Control, City Hall, Toronto, will receive bids until Oct. 9, for the following equipment: One 80,000,000 Imperial gal. low lift centrifugal pump; one 25,000,000 Imperial gal. pumping engine; one alternating current generator; also 16-in. cast iron pipe; 36-in. cast iron pipe; 16 and 36-in. stop valves; 16 and 36-in. cast iron special castings; 72-in., 60-in and 48-in. valves.

Following an explosion, fire broke out in the carriage plant of Adam Spence & Sons and the Mickle Dyment & Sons planing mill at Brantford, Ont. The loss, which includes considerable damage to buildings and heavy machinery, is estimated at $50,000 to the Mickle Dyment plant and $15,000 to the Adam Spence plant. Mickle Dyment & Sons are preparing to remove their works to Toronto.

The Hydro Electric Power Commission of Ontario, University Avenue, Toronto, will build an addition to the transformer station on Davenport Road, to cost $150,000. F. A. Gaby is chief engineer.

The Woodstock Paper Box Co., Woodstock, Ont., proposes to build an addition to cost $150,000. J. Evans, Galt, Ont., is architect.

Metis Beach, Montreal, will install a waterworks plant and is in market for complete equipment. Address the mayor, care McDougall & Pease, 85 Osborne Street, Montreal.

Haileybury, Ont., proposes to install pumping equipment for fire purposes, including 3-stage centrifugal motor driven pumps, to cost about $20,000. H. A. Day is clerk.

The Ford Motor Co. of Canada, Ford, Ont., will build a by-products plant at a cost of $200,000. A. Kahn, Ford City, is architect.

The Brooks Steam Motors, Ltd., 1304 C. P. R. Building, Toronto, is contemplating the erection of a factory at Weston, Ont., to cost $500,000.

The Ever-Ready Auto Top Co. has leased a building in Galt, Ont., and will install equipment to manufacture automobile tops, etc.

The Canadian Non-Exhaust Pneumatic Machinery Co., a subsidiary of the Non-Exhaust Compressed Air Machinery Co., Boston, Mass., is contemplating the erection of a plant at Kingston, Ont. A. Rawson, Montreal Street, Kingston, Ont., is interested.

The Canadian Johns-Manville Co., Ltd., Asbestos, Que., has let the general contract to H. Levasseur, Victoriaville, Que., for the erection of a manufacturing plant.

The Town Council, Jonquiere, Que., will build an addition to the hydro-electric power development plant to cost $75,000.

The town of Wapella, Sask., contemplates installing an electric lighting plant.

The Sinclair Construction Co., Ltd., Excelsior Life Building, Toronto, has the general contract for the erection of a power house, foundations and tailrace at Dam No. 1, Trent River, Campbellford, Ont., in connection with the $250,000 development there for the Hydro-Electric Power Commission of Ontario, University Avenue, Toronto.

The city of Montreal has awarded the general contract to W. M. Irving, 26 Stanley Street, for the erection of a power house on Beaumont Street, to cost $45,000.

Foundations are in for a power development plant at St. Albans, Que., to cost $250,000 for La Cie Hydrolique de Portneuf, and the owners are in the market for two generators, 2000 C. V. motor and turbine. General contractors are the Estrup & Conradi Construction Co., St. Catharines, Ont.

Romeo Morrissettee, engineer, Cap de la Madeleine, Que., is asking for prices on the following equipment for La Cie Aqueduct, Batiscan, Que.: One wooden storage tank, capacity 100,000 gal.; one centrifugal pump, capacity 125 gal. per min.; one centrifugal pump, capacity 75 gal. per min.; also electric and gasoline motors.

John Hayman & Sons, 432 Wellington Street, London, Ont., is having plans prepared for a central heating plant and is asking for prices on material and equipment.

The Hill Rotors, Inc., New York, has been organized to manufacture a rotary air compressor described in THE IRON AGE, Feb. 1, 1923, and developed by the Hill Engineering Co., Inc., 42 Broadway, New York. The machine is available in capacities up to 7½ cu. ft. at 125 lb. It was shown at the International Exposition of Inventions and Investments held in New York, Feb. 16. The new company is licensing manufacturers to make and sell compressors, liquid pumps and other products. The Brown & Sharpe Mfg. Co., Providence, R. I., has acquired the rights for liquid pumps, and it is expected that these will be produced soon at the rate of about 2000 pumps per month. Myron F. Hill, president Hill Engineering Co., is also president of the Rotors company.

STEEL AND INDUSTRIAL STOCKS

Market More Affected by Foreign Than Domestic Conditions

Steadiness characterized the market for industrial stocks in the week just passed. Trading was listless and of insufficient breadth to establish a definite trend, though on the whole professional efforts developed more firmness. Signs of apprehension over the change in administration at Washington were lacking, but there was increasing uneasiness over the foreign situation.

The range in active iron and industrial stocks from Monday of last week to Monday of this week was as follows:

	Low	High		Low	High
Allis-Chalmers...	39⅜	41¼	Lima Loco.	61	62⅜
Allis-Chal. pf....	90	90	Midvale Steel ..	24	25
Am. Can	86⅜	89¾	Nat.-Acme	10⅜	10⅛
Am. Can pf.....	109¼	109¼	Nat. En. & Stm..	56	59⅜
Am. Car & Fdy..	158	161¼	N. Y. Air Brake.	30⅝	31¾
Am. Car & F. pf.	122	122	Otis Steel	7¾	8
Am. Loco.	71¼	74¾	Otis Steel pf....	50	50
Am. Loco. pf....	120	120	Pressed Stl. Car.	49	51
Am. Radiator...	78½	78½	Pressed Stl. pf..	90	90
Am. Stl. Fdries..	34	35	Ry. Steel Spring.	102	103
Bald. Loco.	111½	114¾	Replogle Steel...	9⅞	11¾
Beth. Steel	46⅝	48½	Republic	42⅝	44⅝
Beth. Stl. 7% pf.	89¾	90	Republic pf.	89	91
Beth. Stl. 8% pf.	102½	103	Sloss	42	42
Brit. Emp. Steel	7	7	Steel of Canada.	68	68
Cambria Iron...	41	41	Steel & Tube pf.	107½	110⅝
Chic. Pneu. Tool.	79	81¼	Superior Steel ..	24	24
Colo. Fuel	26	27	Timken Roller...	37⅛	38⅛
Crucible Steel...	59	62¼	Transue-Williams	31	31
Crucible Stl. pf..	85¾	85¾	Un. Alloy Steel..	30⅛	30⅛
Gen. Electric....	172¼	175	U. S. Pipe.....	25	25⅜
Gt. No. Ore Cert.	26¼	27½	U. S. Steel.....	86½	89⅛
Gulf States Steel	68¾	71⅞	U. S. Steel pf...	116¼	117¼
Inland Steel....	33¼	33½	Vanadium Steel.	26⅜	30
Int. Har.	72¼	74	Wick. Spenc. Stl.	7	7
Int. Har. pf.....	107	108¾	Y'gstown S. & T.	64⅞	65

Industrial Finance

The Inland Steel Co., Chicago, showed earnings in the first half of 1923 exceeding those for the full years 1922 and 1921. Net operating profits totaled $3,530,393 as against $2,434,023 for the full year 1922 and $1,728,031 in the full year of 1921. After bond interest, depreciation and depletion there remained a net profit of $2,459,635, or more than double the net of 1922 and nearly five times the net of 1921.

United Alloy Steel Co. stockholders have ratified an increase in the authorized preferred share capitalization from $5,000,000 to $10,000,000. It is not proposed to issue the new stock immediately.

In the six months ending with June last, sales of the Wickwire Spencer Steel Corporation amounted to $16,300,571, against less than $8,800,000 for the corresponding period last year. Operating costs and expenses amounted to $13,351,047, leaving a net of $1,949,524. With miscellaneous income added and charges deducted there was left a profit of $1,506,444, contrasted with $230,461 for the like period last year. The profit, however, does not take into consideration depreciation charges and bond interest.

The Youngstown Sheet & Tube Co. and subsidiary companies report net earnings from operations of $5,779,718, after deducting charges for repairs and maintenance of $2,268,440. Deducting interest, taxes, etc., there remained $3,886,625 applicable for dividends. This allowed $1.25 on common shares. Surplus for the period was $2,402,898. The statement is exclusive of earnings of the Steel & Tube Co. of America.

The American Steel Foundries reports net income for the first half of 1923 of $3,459,324, compared with $1,452,359 for that period of 1922. President R. P. Lamont stated that final arrangements had been completed for the acquisition of the Damascus Brake Beam Co., Cleveland. The terms call for the exchange of one and one-half shares of American Steel Foundries preferred stock for one share of Damascus Brake Beam Co. stock.

Directors of Mesabi Iron Co. will issue 196,567 additional shares of common stock, which are being offered to stockholders at $8. Each holder of three shares of common is entitled to subscribe for one additional share. There are 589,700 shares of common outstanding. Offer is made to stockholders of record Aug. 3, and expires Aug. 15. Proceeds of the sale are to be used for installation of additional facilities to increase production to approximately 800 tons of sinter a day and it is estimated that $1,500,000 will be required for this purpose.

The General Motors Corporation reports gross sales of $362,918,353 in the first half of 1923, the largest semi-annual total in the history of the corporation. After all charges and taxes there was a surplus available for the various classes of stock amounting to $41,585,600, and after allowing for preferred and debenture dividends, there was reported a balance of $38,179,504, available for the 20,646,327 shares of common stock outstanding, or the equivalent of $1.85 a share.

The Reynolds Spring Co. reports net income for the quarter ended June 30 of $48,854, after depreciation and Federal taxes, equivalent to 24c. a share on 146,600 no par common shares. This compares with net income for the second quarter of 1922 of $49,196. Net for the first half of 1923 amounted to $138,026, or 75c. a share on common stock, after allowing for preferred dividends. This compares with net income of $65,765 for the first half of 1922. President Wiley R. Reynolds stated that orders booked for the ensuing six months far surpassed expectations and that these will likely prove the largest in the company's history. Contracts in bakelite and cold molded material now exceed a quarter of a million dollars.

Net earnings of the Sloss-Sheffield Steel & Iron Co. for the first half of 1923 were about $1,700,000, or, after allowing preferred dividends, equivalent to about $15 a share on common stock. Floating debt, which stood at $3,355,000 at the close of 1921 and at $2,631,000 on January 1 last, has been reduced to $475,000. Cash and receivables now aggregate $2,300,000 against $1,852,000 on December 31 last.

Net earnings of the Inland Steel Co. for the first half of 1923 were $2,459,636, more than $1,000,000 greater than those for all of 1922, which were $1,141,177. Plant improvements include the construction of six additional open-hearth furnaces and a new finishing mill, which will increase capacity about 25 per cent. Operations are at 80 per cent and production is sold up to October.

Assets of the Mitchell Motors Co., Racine, Wis., appraised at $1,819,851, will be offered for sale at public auction at the plant on Sept. 12, providing Herbert F. Johnson, trustee, does not receive an acceptable bid during the private sale now being conducted. The plant consists of 35½ acres of land and nine main buildings with an area of 504,800 sq. ft.

Bids are being taken until 5 p. m., Aug. 18, by Julius J. Goetz, 349 Broadway, Milwaukee, for the assets of the Christensen Engineering Co., 1813 Fond du Lac Avenue, Milwaukee, manufacturer of pneumatic appliances.

The United Alloy Steel Co. during the first six months of the year shows operating profits of $3,534,905, or $1,621,792 larger than those for the first six months of 1922. Other income brought the total to $3,719,945, against $1,959,029 last year. For depreciation and interest $1,465,562 was set aside this year, against $684,106 in the first half of 1922. After taxes the net income on June 30 was $1,972,585, compared with $1,274,923 on the corresponding date in 1922. This year $1,000,000 in common dividends was paid out, or $600,000 more than the first half of 1922. Surplus for the first half of 1923 was $857,085 against $759,423.

The Otis Steel Co. showed manufacturing profit of $1,558,493 in the first six months of 1923, as compared with $243,861 for the corresponding period last year. Operating profits were $1,068,560. Net income before depreciation was $809,813, equivalent to $9.17 a share on the company's preferred stock on which 12¼ per cent is due. During the first six months of last year there was a deficit before depreciation of $617,225.

At Toledo, Ohio, Federal Judge Killits appointed Louis J. Hinde, Toledo, and Mark C. Cosgrave, Sandusky, Ohio, receivers for the Matthews Engineering Co., a subsidiary of the R. L. Dollings Co., which recently met financial reverses.

Trade Changes

The United States Electrical Tool Co., Cincinnati, has moved its Detroit district office from the Marquette Building to 50 Canfield Avenue, East, also its Columbus office from 430 North High Street to 509 North Park Avenue.

Luria Bros. Co., Reading, Pa., scrap iron and steel, has opened an office in the Franklin Trust Building, Philadelphia, in charge of Max Silberman, vice-president of the company. The company now has six branch offices and maintains yards in Lebanon, Reading, Coatesville, Donaghmore and Pittsburgh, Pa.

The Oilgear Co., Milwaukee, manufacturer of hydraulic presses, broaching machines, variable speed drives and variable delivery pumps, has moved its office and factory into larger quarters at 398-406 Thirty-eighth Street.

The Evergreen Electric Appliance Co., 411-12 Central Building, Seattle, Wash., has acquired the Bestov Appliance Co., has established a factory and expects to be ready for operation in a few weeks. Frank MacKean is president.

Changes are being made at the works of the Wisconsin Automotive Corporation, formerly the U. S. Tractor & Machinery Co., Menasha, Wis., to enlarge production to include motor trucks, passenger cars and general power farm equipment.

The Harrison Hardware & Furniture Co., St. Petersburg, Fla., has changed its name to the Harrison-Powell Co. W. P. Powell, for many years president, now will take an active

part in the business. Otherwise the status of the company remains unchanged.

The Palmer Steel Co., reinforcing bars and builders' iron work, has transferred its general offices to 274 Main Street, Springfield, Mass. Extensions at the company's Holyoke plant are completed.

F. H. Murray, formerly connected with the Detroit office of the New Britain Machine Co., New Britain, Conn., is now located in Room 1424, Century Building, 202 South State Street, Chicago, where he will handle the sales of New Britain products in the Chicago territory.

Edwin Harrington, Son & Co., Inc., Philadelphia, will change its name, commencing Aug. 1, to the Harrington Co.

Standard Steel & Bearings, Inc., has moved its Philadelphia plant to the new location at Plainville, Conn., which provides a spacious one-floor plant.

Plans of New Companies

The International Hammer Corporation, New York, has been incorporated with capital stock of $100,000 to manufacture electrically-operated hammers of new design. Future plans are not yet completed but it is expected that operations will be started in the near future. The incorporators are E. J. Ohnell, J. C. Barrett and D. A. Nease. Address care of T. F. Bourne, 41 Park Row, New York.

The Tel-U Signal Corporation, New York, has been organized with capital stock of $600,000 to manufacture electric signals and devices. Details of manufacturing will be taken up shortly upon completion of organization matters which will require several weeks. It is likely that the company will operate in New York. The incorporators are J. F. Hughes, V. Taylor and R. L. Deely. Address care of Mr. Fielding, Phillips, Leibell & Fielding, 51 Chambers Street, New York.

The Flanagan Equipment Co., 206 Amsterdam Avenue, New York, has been incorporated with capital stock of $20,000 to manufacture and deal in automobile equipment. It is not planning to undertake manufacturing immediately but will act as dealer for the present. B. A. Leerburger and M. Kurz are the incorporators.

Arthur A. La Porte, Inc., 39 East Fifty-eighth Street, New York, will manufacture hydraulic machinery and parts. Mr. La Porte is taking over a business with which he has been connected for several years. Actual manufacturing may be postponed but the company will operate a general repair shop.

The Horrocks Conveyor Co., Brooklyn, has been incorporated with capital stock of $15,200 to manufacture conveying equipment. Factory and offices are at 415 Schenectady Avenue. Machinery is installed and it is planned to begin operation on roller, gravity and belt conveyors about Sept. 1. F. H. Horrocks heads the company.

The Alarm & Burglar Proof Case, Inc., New York, capital $25,000, is to manufacture safes, metallic cases, etc. Temporary offices are maintained at 375 Fulton Street, Brooklyn, care of J. H. Conlon.

A. H. Peacock, Inc., Brooklyn, has been organized to manufacture electrical fixtures and other electrical equipment. J. F. Sweetman, W. B. McGee and A. H. Peacock, 1682 Myrtle Avenue, Brooklyn, are the incorporators.

The White Enameled Wire Goods Co., Brooklyn, has been organized to manufacture enameled wire products and other specialties. J. Spiegel and S. and F. Seltzer are the principals. Address care of Nelson K. Scherer, 217 Broadway, New York.

Steel-O-Graph, Inc., New York, has been incorporated with a capital stock of $250,000 to manufacture electrical equipment and appliances and radio instruments. Operations have already been started. W. C. Lamphier and J. Wood, Jr., are the incorporators. Address care of J. S. Twaddel, 261 Broadway, New York.

The New Matic Machine Corporation, New York, capital $40,000, will engage in manufacturing machinery. Present plans provide for erecting a plant and installing equipment. K. Lazar heads the company. Communications should be addressed care of Levisohn, Niner & Levisohn, 13 Astor Place, New York.

F. L. M., Inc., New York, has been organized to manufacture engine equipment and mechanical specialties. For the present the company will operate a repair shop. The incorporators are L. H. Goodkind, F. J. Phillips and M. E. Greenfield. Address care of Charles Pechner, 1540 Broadway, New York.

The Grimes Radio Engineering Co., New York, has been incorporated with capital of $25,000 to manufacture wireless equipment and appliances. Temporary address is care of George Agnew, 22 William Street, New York.

The Fox Hardware Co., 71 Warren Street, New York, has been organized with capital stock of $50,000 to manufacture hardware products. Harry L. Rosebaum heads the company.

Jacob & Co., Inc., Indianapolis, have been organized to manufacture metal products, composition specialties, etc. A building has been secured at 635 South Delaware Ave., and operations have begun. Paul R. Jordan heads the company.

The S. B. Sexton Mfg. Co., Baltimore, recently organized with capital of $150,000 to acquire and expand the business by that name at 501 West Conway Street, will continue under the same management with W. Elbert Sexton as president; C. K. Sexton, vice-president; Robert C. Dorr, secretary-treasurer.

The Kentucky Pump Mfg. Co., Evansville, Ind., has been incorporated with capital stock of $200,000, having taken over the business of the Kentucky Tire Pump Co., formerly located at Madisonville, Ky. It will continue making pumps for automotive use and later may add to its line. C. I. Phillips is general manager.

The Bonetto Aero Power Co., Inc., Roanoke, Ill., has been organized to manufacture fluid motor power systems. Manufacturing will be done under contracts. The machines are operated on an inclosed turbine mounted upon a tower and are designed to develop from 1 to 100,000 hp. to generate electricity. D. Bonetto is president.

The North Star Explosives Co., Ltd., has been incorporated with capital stock of $40,000 to manufacture explosives, powder, etc., as a subsidiary of the Hercules Powder Co., Wilmington, Del. Manufacturing will involve no new construction. H. H. Eastman is treasurer.

The Norwalk Enamel Products Co., Norwalk, Ohio, has been incorporated with capital of $500,000 and will engage in the manufacture of enameled signs, table tops, and other products. The plant will contain about 70,000 sq. ft.

The Belfont Iron Works Co., Ironton, Ohio, contemplates making some extensive improvements to its properties, including the installation of a pig-casting machine. All officers and directors were re-elected at the recent annual meeting.

Manganese Ore in 1922

Final statistics of the shipments of manganese and manganiferous ores in the United States in 1922, as compiled by H. A. C. Jenison, of the U. S. Geological Survey, show that 13,404 gross tons of ore containing 35 per cent or more of manganese was mined by 18 companies last year. Of ore containing 10 to 35 per cent of manganese, 344,674 tons was shipped, and of ore containing 5 to 10 per cent manganese, the shipments were 251,614 tons. Montana is credited with 9751 tons of the highest percentage ore and Arkansas with 2264 tons.

Imports of manganese ore and oxide of manganese in 1922 are given as 374,451 tons, Brazil furnishing 275,193 tons. Turkey in Europe supplied 27,561 tons of the total and India 24,548 tons.

Tin exports from the Straits Settlements in June retained the same level as in May, amounting to 5300 gross tons, an increase over the April figure of 4490 tons. Prices, however, showed considerable decline as a result of the release of the Government holdings April 1. The United States took 74 per cent of June shipments of tin against 59 per cent in May, and the United Kingdom, 5 per cent, against 26 per cent in May. Twenty-one per cent went to Europe, compared with 15 per cent the previous month.

The autumn meeting of the Institute of Metals will be held at Manchester, England, Sept. 10 to 13. The second annual autumn lecture on subjects of practical interest to those engaged in the non-ferrous metals industry will be delivered by Lieut.-Col. Sir Henry Fowler on the subject "The Use of Non-Ferrous Metals in Engineering."

The Hydro Forge Co., Alliance, Ohio, has purchased the plant of the Louisville Sheet Steel Co., Louisville, Ohio, which was declared bankrupt a few months ago. The purchase price was $70,000. It is expected that the purchaser will take immediate steps to install new machinery and to make necessary improvements to the plant.

Current Metal Prices

On Small Lots, Delivered from Merchants' Stocks, New York City

The following quotations are made by New York City warehouses.

As there are many consumers whose requirements are not sufficiently heavy to warrant their placing orders with manufacturers for shipments in carload lots from mills, these prices are given for their convenience.

On a number of items the base price only is given, it being impossible to name every size.

The wholesale prices at which large lots are sold by manufacturers for direct shipment from mills are given in the market reports appearing in a preceding part of THE IRON AGE under the general heading of "Iron and Steel Markets" and "Non-ferrous Metals."

Iron and Soft Steel Bars and Shapes

Bars:	
Refined iron bars, base price	3.54c.
Swedish charcoal iron bars, base	7.50c.
Soft steel bars, base price	3.54c.
Hoops, base price	5.19c.
Bands, base price	4.39c.
Beams and channels, angles and tees 3 in. x ¼ in. and larger, base	3.64c.
Channels, angles and tees under 3 in. x ¼ in., base	3.54c.

Merchant Steel

	Per Lb.
Tire, 1½ x ½ in. and larger	3.60c.
(Smooth finish, 1 to 2½ x ¼ in. and larger)	4.10c.
Toe-calk, ½ x ⅜ in. and larger	4.60c.
Cold-rolled strip, soft and quarter hard	7.50c. to 8.50c.
Open-hearth, spring-steel	5.00c. to 7.50c.
Shafting and Screw Stock:	
Rounds	4.65c.
Squares, flats and hex	5.15c.
Standard tool steel, base price	15.00c.
Extra tool steel	18.00c.
Special tool steel	23.00c.
High speed steel, 18 per cent tungsten	75c. to 80c.

Tank Plates—Steel

¼ in. and heavier	3.64c.

Sheets

Blue Annealed

	Per Lb.
No. 10	4.59c.
No. 12	4.64c.
No. 14	4.69c.
No. 16	4.79c.

Box Annealed—Black

	Soft Steel C. R., One Pass Per Lb.	Blued Stove Pipe Sheet Per Lb.
Nos. 18 to 20	4.45c. to 4.80c.	.....
Nos. 22 and 24	4.50c. to 4.85c.	5.10c.
No. 26	4.55c. to 4.90c.	5.15c.
No. 28	4.65c. to 5.00c.	5.25c.
No. 30	4.85c. to 5.20c.	.....

No. 28 and lighter, 36 in. wide, 10c. higher

Galvanized

	Per Lb.
No. 14	4.75c. to 5.10c.
No. 16	4.90c. to 5.25c.
Nos. 18 and 20	5.05c. to 5.40c.
Nos. 22 and 24	5.20c. to 5.45c.
No. 26	5.35c. to 5.70c.
No. 27	5.50c. to 5.85c.
No. 28	5.65c. to 6.00c.
No. 30	6.10c. to 6.50c.

No. 28 and lighter, 36 in. wide, 20c. higher

Welded Pipe

Standard Steel	Black	Galv.	*Wrought Iron*	Black	Galv.
⅛ in Butt	—41	—24	⅛ in. Butt	— 4	+19
¼ in. Butt	—46	—32	¼ in. Butt	—11	+ 9
1-3 in. Butt	—48	—34	1-1½ in. Butt.	—14	+ 6
2½-6 in. Lap.	—44	—30	2 in. Lap	— 5	+14
7-8 in. Lap	—41	—11	2½-6 in. Lap.	— 9	+ 9
9-12 in. Lap	—34	— 6	7-12 in. Lap	— 3	+16

Steel Wire

BASE PRICE* ON No. 9 GAGE AND COARSER	Per Lb.
Bright basic	5.00c.
Annealed soft	5.00c.
Galvanized annealed	5.65c.
Coppered basic	5.65c.
Tinned soft Bessemer	6.65c.

*Regular extras for lighter gage.

Brass Sheet, Rod, Tube and Wire

BASE PRICE

High brass sheet	19 c. to 20 c.
High brass wire	19½c. to 20½c.
Brass rods	17¼c. to 18¼c.
Brass tube, brazed	27 c. to 28 c.
Brass tube, seamless	24½c. to 25½c.
Copper tube, seamless	26 c. to 27 c.

Copper Sheets

Sheet copper, hot rolled, 22¾c. to 23¾c. per lb. base.

Cold rolled, 14 oz. and heavier, 3c. per lb. advance over hot rolled.

Tin Plates

Bright Tin		Coke—14 x 20	
Grade "AAA" Charcoal 14x20	Grade "A" Charcoal 14x20	Prime	Seconds
		80 lb.	$6.55 $6.30
		90 lb.	6.65 6.40
		100 lb.	6.75 6.50
IC.	$11.75 $10.50	IC.	7.00 6.75
IX.	13.00 11.75	IX.	8.25 8.00
IXX.	14.75 13.00	IXX.	9.50 9.25
IXXX.	16.50 14.75	IXXX.	10.75 10.50
IXXXX.	18.50 16.50	IXXXX.	12.00 10.75

Terne Plates

8 lb. coating, 14 x 20

100 lb.	$7.00 to $8.00
IC	7.25 to 8.25
IX	8.25 to 8.75
Fire door stock	9.00 to 10.00

Tin

Straits pig	41c.
Bar	48c. to 53c.

Copper

Lake ingot	17½c.
Electrolytic	17 c.
Casting	16¾c.

Spelter and Sheet Zinc

Western spelter	7½c.
Sheet zinc, No. 9 base, casks	10¼c. open 10¾c.

Lead and Solder*

American pig lead	8c. to 8¼c.
Bar lead	11c. to 12c.
Solder, ½ and ½ guaranteed	29c.
No. 1 solder	27c.
Refined solder	23c.

*Prices of solder indicated by private brand vary according to composition.

Babbitt Metal

Best grade, per lb.	75c. to 90c.
Commercial grade, per lb.	35c. to 50c.
Grade D, per lb.	25c. to 35c.

Antimony

Asiatic	8¾c. to 9¼c.

Aluminum

No. 1 aluminum (guaranteed over 99 per cent pure), in ingots for remelting, per lb.	32c. to 33c.

Old Metals

Business is very quiet and values are lower. Dealers' buying prices are nominally as follows:

	Cents Per Lb.
Copper, heavy crucible	12.00
Copper, heavy wire	11.25
Copper, light bottoms	9.50
Brass, heavy	6.25
Brass, light	5.00
Heavy machine composition	8.75
No. 1 yellow brass turnings	6.25
No. 1 red brass or composition turnings	8.00
Lead, heavy	5.25
Lead, tea	4.00
Zinc	3.75